1998 Natural Resources Element

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The quality of Harford County's natural resources is a large part of the quality of life experienced in the County. The healthier the natural environment is in the County, the healthier the social and economic development of the County. This Natural Resources Element Plan provides a framework for future environmental planning in Harford County. This Plan addresses the need for the identification, conservation, and management of sensitive resources. It was developed in response to the Maryland Economic Growth, Resource Protection and Planning Act of 1992, or the "Planning Act," which required local jurisdictions to adopt a "Sensitive Areas Element" as part of its comprehensive or master plan. To fulfill the State requirements, this Element Plan must address four specific aspects of sensitive areas: streams and their buffers, 100-year floodplains, threatened and endangered species habitats, and steep slopes. Harford County has developed this Natural Resources Element Plan to meet and exceed the requirements of the Planning Act.

The Harford County Code requires the development of a County Master Plan. In July of 1996, the County adopted the 1996 Master Plan and Land Use Element Plan. This Natural Resources Element Plan is one of numerous element plans that make up the Master Plan. The Natural Resources Element Plan sets the framework for the County's policies on resource protection and management. Harford County has made a major commitment in protecting its valuable resources, especially the County's water quality which contributes to the health of citizens and the Chesapeake Bay. Other major themes addressed throughout the Natural Resources Element Plan include:

- watershed planning,
- coordination and streamlining of environmental protection efforts, and
- environmental education/stewardship.

Highlights of the recommendations in the Action Plan Timeline found in Chapter V include:

- draft new rare, threatened, and endangered species legislation;
- update/revise the Natural Resource District regulations;
- develop watershed plans;
- develop a mitigation banking program for wetlands and forests;
- revise the floodplain management ordinance and maps;
- coordinate with the State on wellhead protection and source water assessment efforts; and
- develop an education/stewardship initiative for the County.

INTRODUCTION

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The abundance and diversity of natural resources in Harford County are important attributes of the quality of life in the County. Over the last several decades, the County has experienced rapid growth accompanied by an increased stress on its natural resources. Natural resource protection, however, has been, and will continue to be, a major focus of the County's land use planning process.

In 1978, the County first adopted legislation for the regulation of floodplains. In 1982, Harford County was in the forefront of natural resource protection in the development of the Natural Resource District (NRD) provisions of the Zoning Code. The NRD regulations made Harford County among the first local governments to protect and buffer streams, wetlands, steep slopes and floodplains. Environmental protection has also been realized through a number of additional local programs which include the Chesapeake Bay Critical Area Management Program, the Floodplain Ordinance, and the Forest Conservation provisions of the Zoning Code. In addition, the environmental education programs of the Harford County Public Schools have been instrumental in building an environmental consciousness in the County. Using this strong foundation, this Natural Resources Plan furthers the County's goal of integrated protection of its air, land, and water resources as an element plan of Harford County's Master Plan.

The major purposes of the Natural Resources Element Plan are to address the need for identification and conservation of sensitive resources, the management of these resources during the development process, and the prioritization of areas for preservation as open space or resource enhancement/mitigation areas. The Plan begins by explaining its relationship to the Harford County Master Plan and to the Maryland Economic Growth, Resource Protection and Planning Act of 1992, or "the Planning Act." The second section of the Plan provides the goals and objectives of natural resources management in Harford County and recommendations to reach these goals. The Natural Resources Inventory follows providing a description of the County's geographic setting and a brief inventory of the County's natural resources. The fourth section, Current Regulatory Measures and

Resource Protection Programs, provides a review of existing County natural resource protection measures, as well as a review of County participation in a number of regional, State, and Federal resource protection programs. Finally, the Strategy for the Future section presents an action plan for future work efforts to augment existing programs.

THE MASTER PLAN

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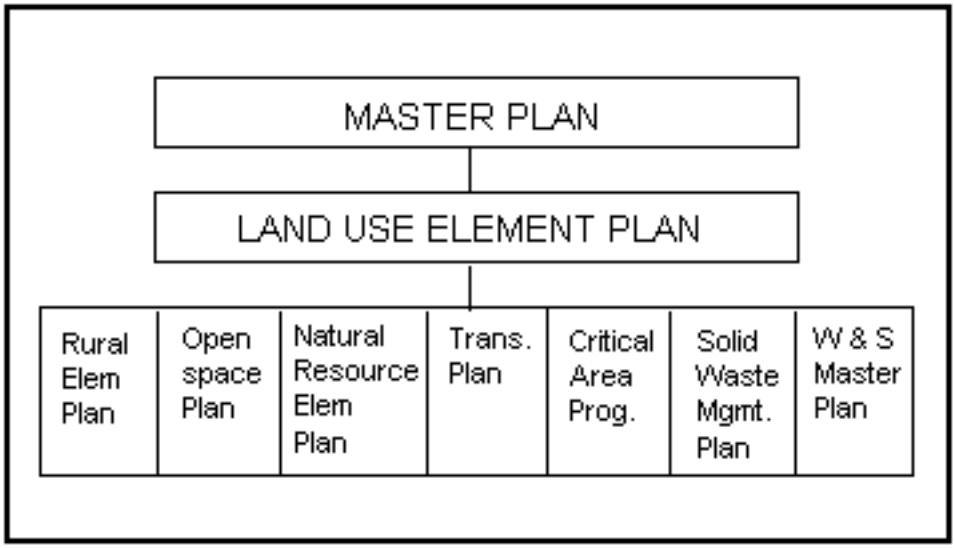
The Harford County Charter requires the development of a County Master Plan. The 1996 Master Plan's "guiding principles" - quality of life, stewardship of our resources, growth management, a sound, balanced and diversified economy, commitment to communities, and coordination among agencies - serve as the common threads providing continuity and consistency among the various plan elements. The Land Use Element Plan is the core of the Master Plan, since it provides the basic strategy that will allow the County to accommodate and manage growth. It is supported by other element plans which further the purpose of the Master Plan. Completed element plans include the Water and Sewerage Master Plan, the Rural Plan, the Open Space, Land Preservation and Recreation Plan (Open Space Plan), the Transportation Plan, the Solid Waste Management Plan, the Chesapeake Bay Critical Area Program, and the Natural Resources Element Plan (See Chart below).



Several of the element plans are interrelated with the Natural Resources Element Plan, particularly the Open Space, Land Preservation and Recreation Plan, the Chesapeake Bay Critical Area Program, and the Rural Plan. All of these plans have as major goals the protection and stewardship of our natural resources. The Open Space, Land Preservation and Recreation Plan focuses on the County's needs for open space and recreational areas and explores the relationship between land used for recreation and the broader goal of land preservation and appropriate use of our natural resources. The Chesapeake Bay Critical Area Program directs its attention to the tidal shoreline of the County and land within 1,000 feet of these tidal areas (See Figure 8). The major goals of this plan are the protection of water quality and conservation of fish, plant and wildlife habitat through regulation of land use within this area. The Rural Plan addresses the preservation of the County's rural character and the promotion of agriculture as an economic enterprise through the preservation of the agricultural land base. Various methods and techniques for protecting the environment are explored, including purchase of development rights and conservation development standards. The more detailed facilities Plans, such as the Water and Sewerage Master Plan and the Solid Waste Management Plan, provide for environmental protection through activities such as sewage treatment and landfill closure and remediation.

As a component of the County's Master Plan, the Natural Resources Element Plan will promote a more highly integrated approach to resource management and provide a framework for future environmental planning. The Natural Resources Element Plan establishes a process for strengthening and streamlining existing programs and broadening coordination between the County's departments and municipalities. It discusses how the County will coordinate its programs with State and Federal programs and will work toward a regional approach to resource management which emphasizes watershed planning. The Plan provides strategies to ensure the compatibility of land uses with identified natural resource priorities and provides for citizen interaction through advisory committees and non-profit groups. These approaches will allow the County to establish and maintain partnerships to protect important natural resources and are fundamental to the Plan. The Natural Resources Element Plan also provides a basis for undertaking more detailed technical studies and mapping efforts to improve the County's present methods of natural resource and environmental protection.

THE PLANNING ACT

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The rapid rate of growth which Maryland has experienced in recent years focused concern about natural resource protection and management. In response to this concern, the State passed the Maryland Economic Growth, Resource Protection and Planning Act of 1992, or "the Planning Act." The Planning Act placed new responsibilities on local jurisdictions to develop comprehensive plans which responded to seven "Visions" outlined in the Act. These "Visions" are:

- Development is concentrated in suitable areas;
- Sensitive areas are protected;
- In rural areas, growth is directed to existing population centers and resources are protected;
- Stewardship of the Chesapeake Bay and the land is a universal ethic;
- Conservation of resources, including a reduction in resource consumption, is practiced;
- To assure the achievement of these policies, economic growth is encouraged and regulatory mechanisms are streamlined;
- Funding mechanisms are addressed to achieve these visions.

The Planning Act requires that local jurisdictions address these "Visions" by adopting a "Sensitive Areas Element" as part of its comprehensive or master plan. This element plan must address the protection and management of specific sensitive areas: streams and their buffers, 100-year floodplains, threatened and endangered species habitats, and steep slopes. Using the initiative of the Planning Act requirements, Harford County has developed the Natural Resources Element Plan. This plan will address the inventory and management of the County's resources, including those identified in the Planning Act, and will protect its environmentally sensitive areas in a coordinated, streamlined manner.

OVERVIEW OF NATURAL RESOURCES

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Bodies of water define much of the County's boundary (See Figure 2). The County is bounded on the

east by the Susquehanna River, on the south by the Chesapeake Bay, and on the west by Little Gunpowder Falls. In addition, other major streams including Broad Creek, Deer Creek, Bynum Run, and Winters Run flow through the County's nine watersheds (See Figure 1). The County also has high-quality ground water resources.

Much of the land in Harford County is rural in nature, with tilled fields, pastures, and woodlands predominating the northern and western portions of the County. The County is divided by the Fall Line, which lies roughly along Interstate Route 95, into two physiographic provinces (See Figure 3). The Coastal Plain lies along the Chesapeake Bay, and the Piedmont area lies above the Fall Line. The County's landscapes offer a variety of vistas from the rolling hills of the Piedmont to the more gently sloped Coastal Plain. This geologic base yields a variety of mineral resources and associated soil types. Management of the County's mineral resources has been addressed in the 1996 Land Use Element Plan, and therefore is not incorporated in this Plan. The variety of soils and topography and relative abundance of water have combined to form diverse natural habitats.

NATURAL RESOURCES MANAGEMENT GOALS, OBJECTIVES AND RECOMMENDATIONS

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INTRODUCTION

This section provides a framework for the protection of the County's natural resources, especially those sensitive resources listed in the Planning Act. Five focus areas are detailed:

1. Resource Protection and Growth Management;
2. Protection of "Sensitive Area" Resources;
3. Protection of Water Resources;
4. Protection of Woodlands, Greenways, and Wildlife Habitat Connections; and
5. Preservation and Improvement of Air Quality.

Using this framework, the plan addresses the seven visions set forth in the Planning Act of 1992. Each focus area contains a goal statement which describes the County's intent. Following the goal statement are objectives which specify how the goal will be addressed and recommendations on how these objectives can be achieved. Finally, a summary discusses the value of the resource discussed, existing programs which protect these resources, and how the recommendations can be implemented.

RESOURCE PROTECTION AND GROWTH MANAGEMENT

When addressing the issue of growth management, resource protection must be an integral element of land use planning. Maintaining a quality natural environment in Harford County is important to the County's social and economic growth. Communities in the County have emphasized the importance of protecting and maintaining the County's diverse and rich natural resources. By providing for necessary growth while maintaining the County's invaluable natural resources, Harford County can foster a high quality of life for its residents and visitors.

GOAL: ***Protect natural resources while promoting planned growth.***

Objective One: Encourage environmentally sensitive development in a manner consistent with the 1996 Land Use Plan Element.

Recommendations: As part of its comprehensive planning process, the County will direct growth away from identified sensitive areas to minimize, and whenever possible avoid, adverse impacts on these areas. This effort should also include environmental protection measures for the perimeter of existing environmental conservation areas such as Leight Park, Swan Harbor Park, Forest Greens conservation easement, Harford Glen Environmental Education Center, Bush Declaration Area, and the State Parks.

Communities should be designed to preserve and protect natural features and sensitive areas.

The County will encourage development design which incorporates innovative site designs, best management policies, mitigation measures, and other techniques to protect the natural environment and identified sensitive areas.

Objective Two: Improve the management of sensitive areas, natural open space, and habitat areas.

Recommendations: The County will review and revise its existing environmental programs and regulations to ensure that they continue to protect the County's natural resources.

The Department of Planning and Zoning will continue to develop and maintain biological resource inventories to assist in land use planning and resource management.

The County will support the work of local land trusts and private property owners to protect environmentally sensitive areas.

The County will work with the State to implement Smart Growth initiatives, including participation in the Rural Legacy Program.

The County shall continue to support the preservation of unique geological formations such as Falling Branch and the King and Queen Seats.

Objective Three: Improve the coordination of environmental protection efforts.

Recommendations: The development review process should emphasize coordination among County, State, and Federal agencies in protecting natural resources and environmentally sensitive areas.

Existing programs will be reviewed to identify opportunities to eliminate duplicate requirements, coordinate activities among departments and agencies, and streamline the permit process.

The County should work with the municipalities, adjoining jurisdictions, and State and Federal agencies, including Aberdeen Proving Ground, to ensure that natural resource issues are addressed in a consistent manner on a regional basis. T

he County will incorporate sensitive area protection as a part of adopted environmental and growth management programs.

Objective Four: Promote the importance of environmental stewardship.

Recommendations: The County will strive to improve public awareness of the importance of environmental stewardship and the economic value of resource conservation through educational programs.

Increased environmental education opportunities should be encouraged through projects that highlight the protection of natural resources.

The County shall manage its parks in an environmentally responsible manner.

The County shall coordinate the development of capital projects to ensure that each project sets a standard for resource protection.

SUMMARY

There is a strong interrelationship between growth management and resource protection in Harford County. The County fully recognizes that the quality of life for its residents is determined, in part, by the quality of its natural resources. As demonstrated in the 1996 Land Use Plan Element, Harford County is using the Development Envelope as a growth management tool to locate development where public services exist or are planned. This helps to protect the rural heritage and natural resources that are so important to the vitality and character of the County. By targeting growth to suitable areas, impacts on the County's natural resources and sensitive areas can be avoided or minimized. The Rural Plan, an element of the County's Master Plan, addresses the need to preserve the County's rural character and promotes agriculture as a primary economic factor.

The County has long been committed to the protection of environmentally sensitive lands. Current local regulations provide protection to sensitive areas such as streams and their buffers, wetlands, steep slopes, and floodplains, whether they occur within or outside of the Development Envelope.

Through tools such as innovative site design and mitigation measures, the development process can provide natural open spaces to Harford County residents. Retaining natural areas in planned developments maintains a diverse environment for County residents. These undeveloped areas also provide an aesthetic, natural separation of land uses and give identity to local neighborhoods.

Furthermore, by encouraging the establishment or protection of greenways or natural corridors, habitat for a diversity of plant and animal species will be provided. These greenways can provide both community and environmental benefits by continuing or establishing the viability of the County's connecting natural systems and wildlife habitats, although these areas are not necessarily public access points as discussed in the Greenways Section (see page 23). By identifying all sensitive areas in and outside the planned growth areas, County departments and agencies can take a proactive approach of protecting these environmentally sensitive areas.

Harford County will strive to improve management of sensitive areas, natural open spaces, and valuable habitats. Currently, Harford County has regulations that protect the habitats of threatened and endangered species within the Critical Area portion of the County. The regulatory measures

needed for the protection of threatened and endangered species County-wide will be explored in this plan. This will fulfill Harford County's responsibility in addressing all of the sensitive area components as identified in Vision 2 of the 1992 Planning Act. Harford County will review existing environmental regulations and revise them as needed to meet the goals and objectives of this Plan. A complete, accurate, and accessible database is essential to the Department of Planning and Zoning's resource management and protection efforts. The Department of Planning and Zoning will continue to update and maintain its biological and natural resource information in the County's geographic information system (GIS). The County will explore innovative options for protecting environmentally sensitive areas. The County has also targeted the acquisition of special lands. One such acquisition has been the 470-acre Swan Harbor Farm on the Oakington Peninsula. The County will also continue to work closely with the Maryland Environmental Trust (MET) and local land trusts, such as the Harford Land Trust, to support their work in protecting environmentally sensitive lands.

A diversity of environmental protection efforts currently exist among local, State, and Federal agencies. Coordination of these efforts is critical to the success of each program. Improving the coordination of these efforts will assist the County in managing these shared natural resources, such as the Chesapeake Bay. The Chesapeake Bay's quality and health is a top priority of the County and State. Harford County works to ensure that natural resource issues are addressed in a consistent manner on a regional basis. Through involvement and coordination with many local, State, Federal, and regional organizations such as the Baltimore Metropolitan Council (BMC), Chesapeake Bay Tributary Strategies, the Maryland Department of Natural Resources (Forest and Wildlife Service), and the Army Corps of Engineers, Harford County plays an integral role in addressing shared resources such as the Chesapeake Bay, drinking water, and air quality. Along with working with regional organizations, Harford County must also work with its local municipalities and Aberdeen Proving Ground. To increase efficiency in protecting natural resources and environmentally sensitive areas, the County will work to eliminate duplicate requirements through better coordination among the various departments and agencies.

The County's land use planning efforts incorporate stewardship of our natural resources as a universal ethic. The promotion of this concept is vital to the long-term conservation of our resources. Education is the main tool to promote and encourage resource conservation. The Harford County Public Schools provide an excellent environmental education program for students, both in the classroom and through resources such as Harford Glen Environmental Education Center. Harford County participates in the Envirothon program, a national competition for high school students to demonstrate their knowledge of environmental issues. Harford County students have recently placed nationally in the top five in this competition in several years. The County also offers excellent educational opportunities for the public at environmental education centers such as the Anita Leight Center located on Otter Point Creek and Eden Mill Environmental Education Center. These centers give the public an opportunity to learn about the natural environment within Harford County. Through the education program established by the National Pollutant Discharge Elimination System Permit, children are receiving education in the importance of water quality and the value of clean streams through stream monitoring and assessment efforts. This education program has been a cooperative effort between the Department of Public Works and the Department of Planning and Zoning, working in partnership with teachers from various high schools, and with Save Our Streams (SOS). The County has also formed partnerships with some of the State Parks located in the County to develop trails that highlight the protection of sensitive resources. With the development of this plan, the

County will strive to identify new ways to improve public awareness of protecting sensitive resources and encourage environmental stewardship.

PROTECTION OF "SENSITIVE AREA" RESOURCES

Harford County possesses a wealth of natural resources. In the context of the Natural Resources Element Plan, "sensitive areas" are streams, their buffers, floodplains, habitats of threatened and endangered species, and steep slopes. These special environmental features are valued by Harford County and protected by multiple legislative actions and regulations. Coordination of these environmental regulations and the addition of watershed management planning will ensure the preservation of the sensitive resources identified in the 1992 Maryland Planning Act.

GOAL: ***Strengthen the County's natural resource protection strategies to ensure consistency with the sensitive area requirements of the 1992 Maryland Planning Act.***

Objective One: Maintain and enhance stream health and water quality.

Recommendations: Watershed management efforts will emphasize the health, maintenance, and restoration of streams and stream valleys. These efforts should include enhancement of existing areas preserved for environmental conservation and education such as Leight Park, the Forest Greens area preserved by Harford Land Trust, State Parks, the Bush Declaration Area, and the lands around their perimeters.

Buffer areas along stream valleys shall be of an adequate width or vegetative composition to provide water quality benefits.

Optimum buffer widths will be defined, and standards will be determined for expanding the buffers to provide for additional protection where steep slopes and other sensitive areas occur.

Objective Two: Improve the County's floodplain management program to minimize public and private property damage from flood hazards.

Recommendations: Floodplains should be retained in their natural state or used for agricultural purposes to preserve and protect their beneficial functions, including their capacity to store and absorb flood waters.

The County's floodplain regulations will be reviewed to ensure that new construction in floodplains, where allowed, will be carried out in accordance with the standards set forth in the National Flood Insurance Program and the State model floodplain ordinance.

The County will continue to participate in the Community Rating System of the National Flood Insurance Program which provides discounted flood insurance to applicable County residents.

Objective Three: Improve the protection of steep slopes.

Recommendations: The County will review its existing Natural Resources District regulations for the protection of steep slopes.

The County will identify and establish protection guidelines for steep slope areas which provide unique habitat or exhibit unique geologic characteristics.

Objective Four: Provide for the protection and management of habitats of rare, threatened, and endangered species.

Recommendations: The County's programs and regulations will be reviewed and revised to ensure the protection of habitats of rare, threatened, or endangered species of flora or fauna.

Working with the appropriate State and Federal agencies, the County shall update its threatened and endangered species inventory.

The County will promote the use of conservation easements and education programs as methods to protect habitat areas.

Serpentine soils which have a high potential for rare plant habitat should be identified and guidelines for their use should be established.

SUMMARY

The 1992 Planning Act identified streams and their buffers, floodplains, steep slopes, and threatened and endangered species habitats as sensitive areas to be protected. In order to strengthen the County's natural resource protection strategy, watershed management efforts should be incorporated

into the land use planning process. Watershed management consists of examining the natural features and land use within a watershed and their cumulative impact on the streams and water resources. Watershed planning will promote land use decisions that enhance protection of sensitive areas. The sensitive areas associated with water quality are important components of this watershed management strategy and will be addressed here.

One of the most effective programs to maintain the health of stream valleys is the establishment of appropriate stream buffers. Buffers are vegetated areas bordering a stream that act as "living filters" by absorbing rainfall, pollutants, and runoff. Vegetated buffers are essential in preventing erosion because the root systems of the plants hold the soil in place along the streams' banks. A forested buffer is more effective than a grass buffer because the trees reduce the force of the impact of rain drops and absorb more excess storm runoff. The streams with the best water quality are usually those that run through forests, i.e., those with riparian forest buffers. Two healthy streams which support native trout are Deer Creek and Little Gunpowder Falls. Both streams have forested buffers that trap sediments, reduce water temperature, absorb storm waters, and deflect erosion. In urbanized areas, impervious surfaces such as buildings, parking lots, and roads cannot absorb and store storm waters so peak flows increase above natural levels. Stream channels of these urban streams are not adequate to discharge these high flows, so severe bank scouring and erosion occurs. Stream banks are washed away and sediments are deposited downstream.

Currently, streams and their buffers are protected and enhanced through several local, State and Federal programs as described in the next section (Protection of Water Resources). Better coordination among these programs will create a more effective stream buffer program. Stream buffers, wetlands and floodplains are often co-existent but are not interchangeable, so some overlap of regulations will continue. In addition, there are numerous areas throughout the County which, through environmental protection and conservation efforts, work to enhance water quality in streams. State and County parks, Leight Estuary Center, Harford Glen Environmental Education Center, and the Bush Declaration Area are examples of environmentally conserved areas which contribute many benefits to water quality. Future watershed management plans should promote enhancement of environmental protection for these areas and their perimeters.

Streams may be ranked according to stream order, a numbering of a river's tributaries from its headwaters (starting point) to its final discharge into a large body of water such as the Chesapeake Bay (see Appendix). Determination of buffer widths according to functional stream classification can provide protection against the cumulative effects of stormwater runoff, pollution, and flushing. By taking into account the amount and origin of water coming into a stream, the land uses in the watershed, and the characteristics of the individual stream, the effects of peak discharges and pollutant loads may be offset and aquatic habitats improved. Where steep

slopes are within the riparian area, buffers should be wider to minimize the effect of topography on runoff. By extending stream buffers where steep slopes exist, water quality can be better protected.

The intent of the County's floodplain management program is "to control floodplain development in order to protect persons and property from danger and destruction and to preserve the environmental quality of the watersheds." The floodplain management program will continue to emphasize the

preservation of the floodplain as an undeveloped area. A local floodplain management program is required by the National Flood Insurance Program so that residents of Harford County may purchase flood insurance. The Floodplain Overlay District ensures that floodplains are maintained in their natural state by 1) prohibiting most construction and 2) setting strict conditions where development is allowed. In some instances, flood-prone structures may be acquired and demolished. Preserving the floodplain in a natural state for the storage of floodwater complements and provides a foundation for a stream buffer program.

Harford County has been recognized by FEMA (Federal Emergency Management Agency) as exceeding the minimum standards of the National Flood Insurance Program. Through the Community Rating System, residents receive a discount on flood insurance. Remapping efforts and outreach programs to floodplain residents help improve the rating received through this program. Through a cooperative agreement with FEMA, digital floodplain maps are being prepared to incorporate more accurate information for properties subject to flood hazards. This remapping project will be followed by a review of the Floodplain Overlay District to incorporate the improved data.

Steep slopes are areas where the terrain changes rapidly. Steep slopes are prone to erosion, and are often associated with uncommon and sensitive habitats such as serpentine barrens and hemlock groves. Protection of steep slopes is important because their erosion contributes to water quality degradation and grading for development would take away from the character and beauty of the County. Steep slopes greater than 25% are currently protected under the Natural Resources District legislation where the area is at least 40,000 square feet in size. Other steeply sloped areas which include significant habitats should be incorporated into the stream buffer program.

Protection of rare species is a cornerstone of natural resource management. Rare species are indicators of unique combinations of climate, soil, topography, and geographic isolation. Protection of these species' habitats is key to protecting the diversity of living resources of an area. Threatened and Endangered Species are plants or animals identified and designated by a State or Federal program as being rare and in need of protection and conservation. Protection of Threatened and Endangered Species habitats exists via the Federal Endangered Species Act, Maryland's Natural Heritage Program, and the Harford County Chesapeake Bay Critical Area Management Program. The County's inventory of Endangered and Threatened Species is coordinated through Maryland's Natural Heritage Program (See Figure 7). Currently, outside the Critical Area, there is no local regulation of rare species habitat. Threatened and Endangered Species need unique environmental characteristics for their habitat. The loss of a fragile habitat may lead to a species' status as Rare, Threatened, or Endangered. County-wide regulations to protect Threatened and Endangered Species habitats from the effects of development will be developed as an implementation tool.

Conservation easements are an effective long-term tool for the protection of sensitive areas and in particular, rare habitats. These easements are voluntarily placed by the landowner on a property as a deed restriction and may provide tax benefits to the owner. Currently, conservation easements are held by Maryland Environmental Trust and the Harford Land Trust on lands that are environmentally valuable. These programs, though successful, have been limited in scope. By developing education programs for landowners about the benefits of conservation easements, it is hoped that more property owners will participate in these programs.

PROTECTION OF WATER RESOURCES

Harford County citizens expect safe drinking and recreational waters. Clean water is fundamental to the public's health and quality of life. In addition to ensuring that an adequate supply of water is available, Harford County must protect the quality of its water by safeguarding ground and surface water sources from pollution and degradation. This can be best accomplished by promoting the coordination of land use activities and resource protection on a watershed basis. By strengthening its water protection efforts and protecting and/or maintaining its wetland resources, the County can achieve its water resources goals.

GOAL: ***Protect and maintain high quality surface and ground water resources.***

Objective One: Implement natural resource planning on a watershed basis.

Recommendations: The County shall develop watershed plans for its major watersheds using the results of the Watershed Planning System Study (WPSS) as well as field data.

Watershed plans will be developed through a coordinated work effort with State agencies and the Department of Public Works.

The County will coordinate with local and State agencies to ensure that the watershed management plans address the goals of the 1996 Land Use Element Plan, the Planning Act of 1992, and other local, State, and Federal environmental initiatives.

Objective Two: Coordinate and strengthen efforts to protect water quality and quantity.

Recommendations: The County will work with Maryland Department of the Environment to meet the requirements of the Safe Drinking Water Act.

The County shall coordinate with the State to develop a wellhead protection program that ensures the quantity and quality of its public groundwater supplies.

The County will coordinate with the Maryland Department of the Environment and the operators of community water systems as they develop wellhead protection plans.

The County will continue to work with the Health Department and other State agencies to ensure the protection of water supplies, including community water systems.

The County will promote the establishment of stream monitoring programs that support County water quality initiatives.

Objective Three: Protect and maintain the County's wetland resources.

Recommendations: The County will coordinate with Federal and State agencies to improve wetland management and permitting processes.

The Department of Planning and Zoning will work with other County departments to develop an off-site mitigation program that addresses County project needs and maximizes wetland resource benefits.

The County will investigate the feasibility of establishing a wetland mitigation banking program.

Objective Four: Implement programs that address the health of the Chesapeake Bay in a manner that promotes multiple benefits.

Recommendations: The County shall periodically review its Chesapeake Bay Critical Area Program, National Pollution Discharge Elimination System (NPDES) permits, and Tributary Strategy Program to identify and act upon opportunities for combined implementation.

The County shall incorporate the goals of the Upper Western Shore Tributary Strategy into its planning efforts.

The Department of Planning and Zoning will work with the Department of Public Works to address the requirements of the County's NPDES permit for municipal stormwater outfalls.

The County shall promote programs which encourage community involvement to achieve the Chesapeake Bay initiatives.

SUMMARY

The protection of water resources must be a priority goal of the County. A watershed approach will be most effective in this effort by using the earth's natural hydrological drainage areas, or watersheds, as the boundary of management decisions. Watershed management addresses chemical and physical water quality, along with habitat assessment, and focuses on broad solutions that are unique to each watershed, addressing the greatest number of concerns. Watershed management is unique in that it provides for an equitable and comprehensive water quality program that allows for local level decision-making concerning non-point source pollution. There are nine major watersheds in the County (See Figure 1), each with unique land use and water quality issues.

The Department of Public Works has completed watershed studies for Swan Creek and Bynum Run. These studies include detailed information and the prioritization of specific water quality problems on each stream. They include the identification of a variety of actions which could improve water quality if implemented. These studies have also identified sites within the watersheds where stormwater retrofit projects can be installed to improve water quality and stream channel integrity. The stormwater retrofit project at Mt. Royal Avenue in the Swan Creek watershed is a prime example of how a retrofit project can be used to improve water quality. Other watershed studies are currently underway. Harford County is currently working with the Maryland Office of Planning in developing models that will attempt to illustrate stream and water quality through different land use scenarios. This Watershed Planning System Study (WPSS) provides data to give local officials and affected communities an understanding of the implications of changes in land use on water quality. The Department of Planning and Zoning will work in conjunction with the Department of Public Works and the Maryland Office of Planning on developing watershed plans for land use, stream restoration, and stormwater retrofitting projects.

Harford County will protect its high-quality ground waters by coordinating and strengthening efforts to protect water quality and quantity. Wherever a public or community groundwater system exists, a wellhead protection program should be developed. These programs will have the basic objectives of

preventing increased risk and reducing existing risk to groundwater resources that supply the public's drinking water. Harford County has recently completed the Perryman Wellhead Protection Study, and will soon begin the legislative, regulatory, and public involvement efforts that will be required to implement a Perryman Wellhead Protection Program. The Maryland Department of the Environment is also assisting the operators of community water systems in the development of wellhead protection plans. Harford County will coordinate with the Maryland Department of the Environment and the operators of community water systems in the development of these programs and future implementation efforts.

With the recent passage of the Safe Drinking Water Act Amendments of 1996, source water protection and prevention was recognized as the first step to provide high quality water to users of public water systems. The Safe Drinking Water Act requires the State of Maryland to develop source water protection programs, and requires the purveyors of public drinking water to conduct the source water assessments for the watersheds contributing to their individual utility by the year 2001. These assessments will delineate the boundaries of the areas providing source waters and identify the origins of contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants. Harford County will work with the Maryland Department of the Environment (MDE), the Environmental Protection Agency (EPA), and other public drinking water purveyors in developing Source Water Protection Programs.

The County will also protect its high-quality surface waters. Harford County already has existing regulations such as Natural Resource District (NRD) and Forest Conservation Ordinance that were designed, in part, to protect surface waters. These regulations are designed to protect streams and associated life forms from stormwater runoff, sediment, and high temperatures. By providing a natural vegetative buffer to streams (either 75' or 150' from center line of stream, depending on stream), sediment and stormwater pollutant loads are minimized. These stream buffers also moderate stream temperature and provide habitat to wildlife. The County's Forest Conservation Ordinance helps protect existing trees and forest resources during the development process. With this Ordinance, trees may have to be planted to offset the loss of trees during development. Trees and forested areas are valuable for many reasons. They help filter pollutants from runoff, thus enhancing water quality. They provide habitat areas for wildlife, as well as shade and wind protection. Trees also add beauty and visual diversity to both our rural and developed areas. The County will examine its current environmental regulations and improve them, where necessary, to better protect surface waters. In addition to regulatory measures, voluntary practices are being undertaken by the agricultural community to prevent soil erosion and nutrient runoff, and thus protect water resources. Implementation of agricultural best management practices (bmps) on farms is supported by the Harford Soil Conservation District through cost share programs and technical assistance. Examples of agricultural bmps are animal waste storage systems, cover crops, grassed waterways, and stream protection measures such as stream crossings.

To protect and maintain wetland resources, the County must coordinate with Federal and State agencies to improve wetland management and the permitting processes. As noted previously, the NRD protects nontidal wetlands and associated buffers. Nontidal wetlands that are protected by NRD are defined as areas that have any of the three commonly used indicators of being a wetland: hydrology, vegetation, or soils that are greater than 40,000 square feet, including but not limited to areas designated as wetland "areas of critical state concern" by the Maryland Office of Planning. This

type of NRD also includes an undisturbed seventy-five foot buffer around the perimeter of the wetlands. Tidal wetlands in the County are protected through the Chesapeake Bay Critical Area Program and State Tidal Wetland Regulations (see Figure 8). The Critical Area program regulates land use and development within 1000 feet of tidal waters and tidal wetlands. Associated environmental benefits of wetlands include providing habitat for a variety of animals, flood management, and filtering stormwater of pollutants into wetlands and streams. Harford County works in coordination with the Army Corps of Engineers and Maryland Department of the Environment in enforcing wetland regulations and violations. The County will coordinate with these two agencies in the efforts to revise the County's existing wetland regulations to complement the State and Federal regulations. Harford County will also explore the feasibility of establishing a wetland mitigation banking program. This program will focus wetland creation and enhancement where it will be most viable and beneficial to the environment in the County.

The County's efforts toward protecting and maintaining high-quality surface waters will also contribute to improving the health of the Chesapeake Bay. All of the County's surface waters eventually drain into the Chesapeake Bay; therefore, programs designed to protect local surface waters also have far reaching positive effects on the Bay. The County recently constructed two Biological Nutrient Removal (BNR) systems at the County's wastewater treatment plants. These BNR facilities greatly increase the amount of nitrogen and phosphorus removed from wastewater. The County will also promote a public education nutrient reduction program, informing citizens of individual actions which may be taken to help reduce the flow of nutrients to our surface waters. These efforts will benefit County residents and all others that enjoy the Chesapeake Bay for recreational purposes. Current programs addressing water quality issues include the Chesapeake Bay Critical Area Program, the NPDES permit, and the Tributary Strategy Program. These programs should be reviewed to ensure coordinated and effective implementation.

Harford County continues to be a supporter of the Chesapeake Bay Program, a multi-state effort established in 1983 which made the restoration of the Bay's living resources its top priority. Harford County was awarded a Silver Award as a Chesapeake Bay Partner by the Chesapeake Bay Partner Community Program for its participation in efforts to protect and improve Bay resources. The Chesapeake Bay Program recognizes the significance of local decisions on the health of the Chesapeake, and Harford County has been a proactive supporter of these Chesapeake Bay Program policies. Additionally, Harford County is the location of one of Maryland's Chesapeake Bay National Estuarine Research Reserve component sites. The recently constructed visitor center at Leight Park, on Otter Point Creek, provides an environmental teaching and learning center for the public. Harford County will continue to encourage community involvement through individual actions or private environmental groups which strive to restore the Chesapeake Bay. Visitors centers, such as Leight Park, and community involvement in the Chesapeake Bay Program will serve as excellent tools for fostering a sense of stewardship of our water resources.

PROTECTION OF WOODLANDS, GREENWAYS, AND WILDLIFE HABITAT CONNECTIONS

Natural resources are valuable not only as individual components such as stream valleys or rare habitats, but also as connected systems that function together. The County recognizes the value of its natural resources as ecological systems such as greenways and wildlife habitats. Greenways can connect areas of interest for passive recreation and act as buffers between developed areas or may be available for public use. Wildlife corridors provide connections between food sources, water sources, and shelter for a variety of wildlife species. By protecting areas as connected systems, the variety of wildlife that use the area is greatly increased. Using a watershed approach, the County will investigate how natural resources can be protected and enhanced as connected systems.

GOAL: ***Manage the County's varied resources to ensure their continued viability.***

Objective One: Improve the protection and enhancement of habitat connections and associated sensitive areas.

Recommendations: The County will identify areas for the preservation or establishment of natural corridors or other open spaces to provide multiple habitat or water quality benefits and will develop programs to protect these areas.

The County will develop watershed-based management strategies to provide for stream valley protection, forest conservation, wildlife habitat, and greenways.

Natural corridor areas should be identified during the development review process and protected as passive open space.

The County will investigate public-private mechanisms to provide for the acquisition of lands that function as natural corridor areas.

The County will continue to coordinate with State agencies, the municipalities, and citizen groups to encourage the establishment of greenway projects.

The County should work with State agencies and local citizen groups to implement the intent of the State's Deer Creek Scenic River Plan.

Objective Two: Improve the protection of the County's forest resources.

Recommendations: The County's Forest Conservation Program will continue to be reviewed to identify areas where program effectiveness and efficiency can be enhanced.

The County will coordinate with other agencies and departments to establish forest mitigation and monitoring programs, investigate mitigation banking options, and continue to pursue the establishment of off-site mitigation programs.

The County will identify and map forested areas that function as habitat for native and migratory forest dwelling birds and for forest-dependent species, and then shall develop programs to protect these areas.

SUMMARY

The greenways and wildlife corridors often associated with streams or rivers provide "green" connections between the larger natural areas of the County. Natural resources found in greenways and wildlife corridors are more valuable together than as individual parts. Combinations of fields and forests, waterways, and wetlands enhance the number and diversity of wildlife that are able to live and reproduce in an area. Certain types of wildlife cannot survive without specific combinations of natural resources, or without large, undisturbed areas of forest. Other functions of natural corridors are enhanced by this combination of natural resources. For example, ground water recharge is enhanced where upland forests occur in combination with spring seeps and streams. Thus, drinking water for human use is typically cleaner and more plentiful in areas where forests are abundant and occur around waterways, than in areas where urban features dominate the landscape. The greenways which are open to the public also provide excellent opportunities for recreation. Hiking, biking, horseback riding, canoeing, tubing, and bird watching are examples of activities enjoyed in Harford County's greenways. In other instances, greenways are not public access points, but still may provide many benefits such as wildlife habitat connections, aesthetics, and water quality management.

Conservation, preservation, and protection of the County's forests, greenways, and wildlife corridors can be accomplished by protecting habitat connections, maintaining ecological viability, and improving the integrity of the County's communities. This will be a three-pronged effort. The first effort will be coordination of existing programs. The second effort will be to make an inventory of the County's forest and tree resources which will be used to prioritize areas for preservation, acquisition, and habitat enhancement. Finally, the County will continue to educate the public about natural resource conservation and encourage environmental stewardship.

Several existing local programs currently regulate activities within forests and corridors, including: the Forest Conservation provisions, the Natural Resources District, the Floodplain Ordinance, the Deer Creek Scenic River District, and the Chesapeake Bay Critical Area Program. These local programs

are implemented primarily during the development review process. The County will cooperate with the Chesapeake Bay Program goal of planting 600 miles of stream-side buffer in the State of Maryland by the year 2010. In addition, the County is in the process of preparing legislation for stormwater quality standards to address NPDES permit requirements. Watershed studies discussed earlier identify areas in need of streamside buffer plantings. These programs and interagency cooperative activities will be reviewed to improve interagency coordination for planting of forest buffers.

A more detailed forest inventory will be made to evaluate these resources in terms of their size, quality, public versus private ownership, and location relative to watersheds and population centers. Special forest and tree resources such as champion trees, old growth forests, and forest interior dwelling bird species habitat will be identified. Such an inventory should be used to prioritize areas for future mitigation projects, open space acquisitions, and establishment of additional greenways. A coordinated effort between the Department of Planning and Zoning and the Department of Parks and Recreation will most effectively use this inventory as a tool for preserving these sensitive areas. The County may develop a mitigation bank to coordinate local forest and wetland mitigation efforts and provide enhanced environmental benefits.

Two of the largest existing public greenways in Harford County are the State Parks along the Little Gunpowder Falls and Susquehanna River. In addition, several State, municipal, local, and private organizations are cooperatively developing the Lower Susquehanna River Greenway, which connects both shores of the Susquehanna River below the Conowingo Dam with many recreation and tourist opportunities. Harford County has also been developing the Ma and Pa Trail System, which will create a hiker/biker trail system along the abandoned Maryland and Pennsylvania Railroad. The County will continue its efforts in the establishment of these trail systems, integrating these with currently protected park lands. This is described more fully in the Harford County Land Preservation and Recreation Plan.

Environmental stewardship and education will continue to be an important aspect of the County's efforts to conserve forest resources and protect greenways and wildlife habitat connections. The balance between private property rights and the common good through protection of natural resources is a major theme for public education. Understanding this theme helps the public draw the most benefit from the efforts of individuals through private stewardship and the efforts of government to regulate natural resources.

PRESERVATION AND IMPROVEMENT OF AIR QUALITY

Clean air is fundamental to public health and safety and the quality of life of Harford County residents. Through the Clean Air Act and its amendments, the Maryland Department of the Environment monitors air quality, establishes standards for air emissions, and may take enforcement actions. Harford County has initiated efforts to coordinate land use and transportation planning to achieve State and Federal standards for air quality. Harford County's 1994 Transportation Plan identifies strategies that the County will use to reduce pollutants in the air. The Natural Resources Element Plan will also increase the public's awareness of the importance of clean air and promote initiatives to protect air quality.

GOAL: ***Promote initiatives to protect and improve air quality.***

Objective One: Coordinate land use and transportation planning to assist the County in achieving State and Federal standards for air quality.

Recommendations: The Transportation Plan will be reviewed to ensure that its implementation strategies support development that is consistent with the goals of the Clean Air Act.

The County will work with State and Federal agencies to address the regional impacts of both point and nonpoint sources of air pollution.

The County will encourage increased use of carpooling, public transportation, and other such options for reducing air pollutant loading levels.

The County will support the establishment of pedestrian and bicycle paths and other systems that encourage non-motorized transportation.

The County will investigate the feasibility of using more natural gas vehicles in the County fleet.

The County will continue its Adequate Public Facilities and its growth management practices by concentrating growth in the Development Envelope to improve air quality by shortening travel times for daily trips.

Objective Two: Increase the public's awareness of the need to reduce air pollution and ways to accomplish this.

Recommendations: Working with the State, the County will create technology guidelines and educational programs that explain the importance of high air quality in homes, businesses, and industries.

The County will strive to improve the public's awareness about home-based activities that contribute to air pollution and the value of resource conservation.

The County will develop a program to educate citizens about ozone alerts and what can be done to reduce emissions.

The County will encourage the expansion of the public transportation system within the County.

The County will continue to research innovative approaches to reduce peak hour emissions and ozone levels (e.g., teleworkcenters, telecommuting).

SUMMARY

The provision of clean air is fundamental to public health, safety, and quality of life. The Baltimore Metropolitan region, which includes Harford County, is considered a nonattainment area by the U.S. Environmental Protection Agency. Although it has been noted that the air quality in this region may be attributed to influences and contributions from outside the region, the Baltimore region does contribute significant automobile emissions which affect the region's air quality. The Clean Air Act and its amendments, along with the 1991 Intermodal Surface Transportation Efficiency Act, provide federal guidelines to local jurisdictions in improving air quality.

The Clean Air Act was first passed by Congress in 1955. In later years, the Clean Air Act Amendments established the current framework of a local-state-federal partnership in air quality control. With Amendments in 1990, the reduction of emissions, especially those that produce ozone, became one of the main objectives. The Act also defines geographical areas where air quality is measured against the National Ambient Air Quality Standards. Those areas that meet the national standards are considered "attainment areas," while those areas that do not meet the standards are classified as "nonattainment areas."

Harford County has adopted plans and implemented programs to assist in reducing air pollution, one being the 1994 Harford County Transportation Plan. One of Harford County's goals in the Transportation Plan is to increase the efficiency of existing transportation systems and reduce travel demands. These goals will fulfill the County's commitment in implementation of the Clean Air Act Amendments of 1990 and objectives of the Intermodal Surface Transportation Efficiency Act of 1991. In promoting non-motorized (bicycle and pedestrian) transportation and making future transit improvements, Harford County will contribute in reducing air pollution over the region.

Harford County's other programs that assist in reducing air pollution are identified below:

- Harford County operates a Ride-Share Program to encourage residents to use the eight County park and ride lots, mass transit, MARC train service, and carpooling. Computerized ridematching, transit routes, and schedules are available to Harford County residents.
- Through the Baltimore Metropolitan Council (BMC), Harford County is involved with two major initiatives: the update to the Long Range Transportation Plan for the region and the Baltimore Region Transportation Improvement Program. These initiatives ensure that Harford County is in conformance with the Clean Air Act.
- Harford County has developed a report through the Local Transportation Assistance Grant with the Maryland Office of Planning. This report used three community planning councils as focus areas to develop non-motorized transportation efforts, transportation control measures, and Intelligent Transportation Systems in an effort to reduce the number of automobiles on County roadways. An example of the techniques being explored is "Telecommuting." Telecommuting gives employees the ability to use their home or a designated center for work activities several times a week. This intends to reduce the number of single-occupant vehicles for commuting purposes and improve regional air quality by reducing emissions.

Harford County Government has also taken steps in better informing its own employees on reducing air pollution, especially ground level ozone. Ground level ozone is a colorless gas that is formed by a chemical reaction between volatile organic compounds (VOCs) and oxides of nitrogen in the presence of sunlight. VOCs can be found in, but are not limited to, oil-based paint, insecticides, fuels, and internal combustion engine emissions. High levels of ground level ozone can cause respiratory irritation in everyone, especially children, the elderly, and people who suffer from heart and lung disease. Ozone pollution also harms vegetation and forests because it causes early leaf drop and lower growth rates. Statewide, an enhanced Vehicle Emission Inspection Program was recently established as a method to reduce ozone pollution. Also, an administrative policy regarding the Harford County Ozone Action Plan was recently signed. This policy directs all applicable County agencies to comply with the Maryland Department of the Environment guidelines on ozone red alert days. Some of the common guidelines followed during these red alert days are not refueling until late afternoon, minimizing the use of any gas powered small equipment, not applying oil-based paints, and reducing vehicle use.

Harford County is progressing in increasing the public's awareness of the need to reduce air pollution. In coordination with MDE, the County Health Department has initiated a Radon Awareness Program. The purpose of the program is to increase the public's awareness of radon, and to supply radon testing kits at affordable rates to County citizens. Information regarding this program can be found in the County public libraries, newspapers, and local cable channels.

Harford County is committed to meeting the requirements of the Clean Air Act in a manner that protects public health while sustaining economic vitality. Harford County will continue to promote initiatives that improve air quality. Clean air is a great asset, necessary to the quality of life expected and demanded by the citizens of Harford County.

Harford County is located in northeastern Maryland where the Susquehanna River meets the Chesapeake Bay. Harford County contains three municipalities: Aberdeen, Bel Air, and Havre de Grace (See Figure 2). Another important area in the County is Aberdeen Proving Ground, a Federal facility on the eastern side of the County which is outside the jurisdiction of the County. The County has a land area of about 440 square miles, including the 61 square miles of Aberdeen Proving Ground.

This chapter of the plan describes the County's resources within a watershed approach and covers: Climate, Geology, Topography, Soils, Surface Waters and Watersheds, Floodplains, and Flora and Fauna. Those topics discussed in further detail in the Appendix are: Soils, Classes and Orders of Surface Waters, and Plants and Animals (including rare, threatened, and endangered species).

CLIMATE

Harford County is located approximately midway between the mild climates of the southeastern United States and the harsher climates of the northeast. In addition, the area is subject to the modifying influences of the Appalachian Mountains to the west and the Chesapeake Bay and Atlantic Ocean to the east. This combination results in a climate with warmer winters than areas farther inland at the same latitudes. Annual precipitation averages 41.49 inches. The month of highest average rainfall is August, and the month of lowest average rainfall is January. The average annual temperature for the area is 55 degrees F. The month of highest average temperature is July, averaging 76.8 degrees F, and the month of lowest average temperature is January at 32.6 degrees F. The average for the last occurrence of freezing temperatures in spring is mid-April, and on average, the first frost in autumn is in late October. This allows for a frost-free growing season of approximately 194 days. (National Oceanic and Atmospheric Administration data from 1951-1978, as reported in the APG Management Plan for the Bald Eagle, 1996).

GEOLOGY

Harford County is part of two distinct geologic provinces: the Piedmont Plateau and the Coastal Plain (See Figure 3). The northwestern eighty percent of the County is located within the Piedmont Plateau, and the remaining twenty percent is within the Coastal Plain, bordering the Chesapeake Bay. The Fall Line, or the boundary between these two provinces, roughly follows Interstate Route 95. The Piedmont Plateau is underlain by a bedrock of crystalline rocks, mostly schist and gneiss. Overlying the crystalline rocks are metamorphic rocks consisting of Cockeysville Marble, and, above it, the Wissahickon Schist formation. The Coastal Plain is a broad lowland underlain by layers of sand, gravel, and clay laid down during the rise and fall of ancient oceans. This layer of unconsolidated sediments covers the crystalline rocks in the northern Coastal Plain and becomes thicker toward the Chesapeake Bay. Marshy tidal areas, tidal streams and estuaries border the Bay.

TOPOGRAPHY

Coastal Plain elevations rise gradually, ranging from sea level at the Chesapeake Bay to four hundred feet in its most northern areas, where it joins the Piedmont. The Coastal Plain is generally flat to gently sloping. Piedmont elevations range from the Fall Line (approximately 140-180 feet above sea level) at the boundary with the Coastal Plain to about eight hundred feet in the Whiteford area. The Piedmont is characterized by rolling hills with steep and often rocky slopes, especially adjacent to streams. The rolling topography of the Piedmont Plateau is extensively dissected by many small streams and rivers (See Figure 4).

SOILS

The County's soils fall roughly into the three major associations of the Upper Piedmont, Lower Piedmont, and Coastal Plain. The predominantly well-drained soils of the Upper Piedmont cover the northwest half of the County. These soils are gently to steeply sloped, and are deeply cut by streams. Soil types of this area include Manor, Glenelg, Chester, Glenville, Elioak, Stony Land, Brandywine, Codorus, Comus, Hatboro, and Baile. Most of this area is farmland and woodland. The Lower Piedmont is located southeast of the Upper Piedmont area, and follows a ridge which runs diagonally across the County from Dublin to Benson along Route 1. Broad flats and large, poorly-drained areas with occasional outcroppings of serpentine are located along either side of this ridge. The third major association of soils in Harford County are the soils of the Atlantic Coastal Plain. Coastal Plain sediments are layers of clay, silt, loam, sand, and gravel. Poorly-drained, silty, or clayey soil types are common in the Coastal Plain and include: Delanco, Elkton, Fallsington, Hatboro, Capered, Chancery, Leonardtown, Loamy and Clayey Land, Matapex, and Othello. Wetlands are prevalent throughout these soils. The drier sandy and loamy soil types of the Coastal Plain include Joppa, Beltsville, Elsinboro, Evesboro, Mattapeake, and Sassafrass. Soils are described in more detail in the Appendix. Hydric soils are shown on the wetland soils map (See Figure 5).

SURFACE WATERS AND WATERSHEDS

The land area of Harford County is divided into nine major watersheds (See Figure 1). The northern part of the County is drained principally by Broad Creek, Deer Creek, and numerous tributaries which flow into the Susquehanna River near the City of Havre de Grace. Swan Creek, James Run, Bynum Run, Winters Run, and Little Gunpowder Falls and their tributaries flow southward through the Piedmont and across the gently sloping Coastal Plain to the Chesapeake Bay. Church Creek is the only major stream which is entirely within the Coastal Plain. Watershed acreage is provided in Table 1.

Table 1. Watershed Drainage Areas

	Acres
Deer Creek	91,927
Winters Run	40,950
Broad Creek	27,595
Little Gunpowder Falls	24,371

Bynum Run	15,833
Swan Creek	15,543
Church Creek	12,573
James Run	7,250
Susquehanna/Havre de Grace	6,830

As described above, the major surface waters of Harford County are the Susquehanna River, Broad Creek, Deer Creek, Swan Creek, Bynum Run, James Run, Church Creek, Winters Run, and Little Gunpowder Falls. There are no natural lakes in Harford County. Man-made ponds and reservoirs have been created throughout the county by the damming of streams and rivers. Conowingo Dam on the Susquehanna River and Atkisson Dam on Winters Run are the major dams in Harford County. Classes and orders of surface waters in Harford County are described in Appendix 1.

FLOODPLAINS

Floodplains are lands that are subject to periodic flooding from water. It is not the horizontal distance from a shoreline that is a guarantee against flooding but the elevation of a property in relation to a flood level. Harford County's floodplains include both riverine and tidal areas, but are primarily riverine.

Floodplains are the bottom lands along a stream valley that usually contain fertile soil which is useful for cropland or pasture. These have important biological values and may include tidal and non-tidal wetlands which provide habitat for animals and plants. Vegetation in the floodplain becomes a "living filter" for both surface and subsurface water running off the surrounding hillsides. This "living filter" can intercept and slow runoff which will percolate into the ground and provide storage of flood waters. Forested stream buffers provide the greatest protection against flooding. Maintaining the flood storage capacity of floodplains is very important for reducing flooding. Harford County's policy has been to preserve floodplains as undeveloped, where possible, and restrict building in the floodplain.

Many factors can affect the depth of flooding: the amount of land that drains into a river (its drainage area or watershed), the land use in the drainage area, the presence of paved and impervious surfaces, the amount of precipitation, soil types, and the size of the stream or river channel. A change in any one of these factors can increase the peak flow of the flood event and change the floodplain and stream channel. Most of the watersheds in Harford County are small and thus flooding is caused by local weather. For example, the riverine floodplains of the Bush River and Swan Creek are located within the County's boundaries; flooding in these watersheds is caused by intense local storms and snow melt.

The drainage area of Deer Creek extends into Baltimore County and Pennsylvania and its flooding is sometimes caused by storms in Pennsylvania. The drainage area of the Susquehanna River on the other hand extends into other Maryland Counties, Pennsylvania, and New York State; its flooding is therefore affected by regional storms and by the operation of the numerous upstream dams.

FLORA AND FAUNA

Woodlands are valuable natural resources which provide numerous benefits. Among these benefits are wildlife habitat, filtering of air and water, passive recreation, buffers between land uses, and production of fiber products such as timber and pulp for paper.

Prior to the coming of Europeans to America, woodlands were the predominant land cover of Harford County. Much of the County has been cleared and cultivated for the last two centuries. The most common type of the remaining woodland is made up mostly of oaks, although pine, tulip poplar, hemlock, beech, maple, gum, and willow also occur frequently. Currently, about 18% of the County is covered by woodlands (See Figure 6). Some successional reforestation has occurred as abandoned farmland becomes vegetated first as a mix of grasses, other herbaceous plants, brambles, shrubs, and tree saplings take over the area. Over the next decade, the saplings grow up and form a closed canopy, and a forest covers the area. Certain areas such as permanently flooded swamps and rock outcrops cannot support forests. These areas are vegetated by combinations of shrubs and other vegetative cover.

Aquatic habitats are found in creeks, rivers, and the Chesapeake Bay described above. Harford County's waters provide habitat for insects, fish, shellfish, frogs, turtles, waterfowl, and other aquatic animals such as beavers and otters. Aquatic habitats also provide linkage of the foodchain which connect living resources along the watercourses from spring seeps, down through streams, to a river or the Bay. Wetlands are transitional areas between upland and aquatic habitats, and, as such, are used by both upland and aquatic wildlife. The Maryland Department of Natural Resources publication, *Wetlands of Maryland*, lists sixteen types of wetlands in four major groups, and covering over 12,000 acres (including APG). Slightly more than half of this area is estuarine, or under the influence of tidal waters. The remaining wetland area is predominantly palustrine. Palustrine wetlands include freshwater marshes and swamps, ponds, stream banks, and spring seeps.

Rare habitats are areas unique in their combination of physical characteristics and living things. The Susquehanna shoreline is an example of such an area, where the north-facing slope along the River provides a cooler microclimate than is found elsewhere in the Country or the State of Maryland. There are species of plants and animals that occur in this area which are not found anywhere else in the Country or the State. The Department of Natural Resources, Natural Heritage Program (NHP), records 9 rare animal species and 64 rare plant species for Harford County . These rare species are distributed among 58 rare habitat locations (See Figure 7). Five of these rare habitat locations denote rare communities, unusual for this part of the State. Bog turtle habitats, which are still being studied and are not shown on Figure 7, occur in many locations throughout the County. Other rare habitats may exist which have not yet been recorded by NHP. Species of rare animals and plants recorded as occurring in Harford County are listed in Appendix 2.

REGULATORY MEASURES AND RESOURCE PROTECTION PROGRAMS Top ▲

LOCAL REGULATORY MEASURES

The Natural Resources District (NRD) was established in 1982 to preserve significant/special environmental features throughout Harford County. This district provides for orderly development and use of land while protecting the ecology of the area by minimizing the soil disturbance and loss of natural ground cover and vegetation. Lands within this district are: a) Steep terrain (areas of land exceeding 40,000 square feet with a slope in excess of 25%); b) Areas adjacent to streams and rivers (minimum distance of 75 feet or 150 feet on both sides of the stream depending on the stream classification); and c) Nontidal wetlands (areas exceeding 40,000 square feet).

The Chesapeake Bay Critical Area Management Program and the Chesapeake Bay Critical Area Overlay District are administered by the Department of Planning and Zoning as a part of a coordinated State effort to improve water quality and wildlife habitat throughout the Chesapeake Bay. The program manages lands within 1000 feet of tidal waters and also includes some additional floodplain, park, and rare species habitat areas (See Figure 8). The program protects natural resources including: tidal and nontidal wetlands, shoreline buffer, rare species habitats, anadromous fish breeding habitat, forests (especially riparian forests), forest interior bird breeding habitat, colonial waterbird nesting sites, waterfowl congregation areas, hydric and erodible soils, and steep slopes. Harford County's Critical Area Management Program was adopted in 1988 and has been legislatively updated twice, most recently in 1997.

The Floodplain Management Regulations restrict building in areas subject to periodic flooding from streams, rivers and the Chesapeake Bay. Floodplains are often described in statistical terms. The 1% annual flood is an area that has a 1% chance of being flooded in any given year; it is often referred to as the 100 year flood. Most of the floodplains with large drainage areas (greater than 100 acres) are mapped and subject to regulation, even though areas not identified on maps as floodplains may still flood.

The areas subject to the County's floodplain management program are depicted on flood maps available at the Department of Planning and Zoning. These maps (also known as Flood Insurance Rate Maps, FIRMs, and Floodplain Boundary and Floodway Maps) are produced by the Federal Emergency Management Agency and delineate special flood hazard areas for the larger streams and rivers in the County. In addition to the Special Flood Hazard Areas, the County also regulates floodplains in new subdivisions with drainage areas greater than 100 acres. In this way, the County assures that new subdivisions are not built in a floodplain. By encouraging sound land use practices, the exposure of property to flood losses may be minimized; human life and health can be protected; and public expenditures for flood protection and relief minimized.

The Forest and Tree Conservation Provisions of the Harford County Code were adopted in 1991. The intent of the law is three-fold. First, it requires that the natural features within a proposed development site be identified and delineated by an approved professional forester or landscape architect before a development plan for the site is submitted to the County. Second, it requires that a portion of the existing forest resources on-site be retained. Finally, it requires that a measure of the forest resources which are lost as a necessary element of the development process be replaced. The County then created a "Forest Cover Conservation and Replacement Manual" which integrates the

requirements of the 1991 Law into the County's development review process. This Manual contains information which is used in the preparation of Forest Stand Delineations and Forest Conservation Plans. It also provides guidance on reforestation, afforestation and individual tree landscaping.

The Deer Creek Scenic River District was established in 1978 to highlight the importance of Deer Creek's scenic and natural features, and to ensure the protection of private rights and the scenic river in a compatible, harmonious manner. Deer Creek is designated as a Scenic River under the State's Scenic River program. The local Deer Creek Scenic River Advisory Board (composed of nine members appointed by the County Executive and confirmed by the County Council of Harford County) was established to initiate and recommend policies and regulations to the County Council to enhance and protect the quality of Deer Creek. Except for the reasonable extension or repair of existing buildings or dam structures, any new construction or commercial development within 150 feet of the normal banks of Deer Creek is reviewed by the Advisory Board before issuance of a zoning or building permit. The erection of any sign in this same setback area, except for private trespassing signs or real estate "for sale" signs of 3x3 feet, is subject to the same review of the Board.

Stormwater Management Regulations in Harford County address water quantity, specifically for the 2- and 10-year storms. There are also requirements for 100-year storm management for development above Reckord Road in the Little Gunpowder watershed, and above Business Route 1 in the Bynum Run watershed. These regulations involve calculating the amount of stormwater runoff that would be created during these major storm events, and ensuring that proper management techniques are installed to handle these storms. For more information, refer to Chapter 214 of the County Code which deals with stormwater quality and quantity management.

Sediment and Erosion Control Regulations in Harford County mandate that any disturbance of land greater than 5000 sq. ft. or the movement of more than 100 cubic yards of earth must have an approved sediment control plan in order to receive a grading permit. The Harford County Department of Public Works, Department of Planning and Zoning, the Harford Soil Conservation District, and the National Resources Conservation Service work jointly in approving the sediment control plan. The Harford County Department of Public Works issues the grading permit after approval of the plan.

STATE AND FEDERAL REGULATORY MEASURES

State Wetland Regulations are administered by the State of Maryland to protect tidal and nontidal wetlands. The State Wetlands Act was enacted in 1972 to protect Maryland's tidal wetlands. This Act (COMAR 08.05.07) made waters below mean high tide the property of the State of Maryland. In 1988, the State entered into a Memorandum of Understanding with the ACOE to create a Joint Permit Application for construction in any floodplain, waterway, or wetland area in the State of Maryland. The State Nontidal Wetlands Protection Act (COMAR 08.05.04) was enacted in 1989 which requires a State permit for clearing and/or construction in, discharge to, or dredging of nontidal wetlands or their 25 foot buffers. These laws gave the Department of Natural Resources (DNR) authority to issue permits for construction, dredging, and filling activities in tidal and nontidal wetlands. This authority was later transferred to the Maryland Department of the Environment (MDE). Joint Permit Applications are received at MDE, and are copied and distributed among the

cooperating agencies which review and comment on permit applications.

Federal Wetland Regulations are based on the Rivers and Harbors Act of 1899, and the Clean Water Act. Under Section 404 of the Clean Water Act, the Secretary of the Army, acting through the Chief of Engineers (Army Corps of Engineers or ACOE), is authorized to issue permits for the discharge of dredged or fill materials into wetlands, with program oversight by the Environmental Protection Agency (EPA). EPA has the authority to make final determinations on the extent of the Clean Water Act. This authority covers regulation of tidal and nontidal wetlands. The ACOE also issues permits for filling, dredging, and other construction in certain wetlands under Section 10 of the Clean Water Act. Under authority of the Fish and Wildlife Coordination Act, the Fish and Wildlife Service and the National Marine Fisheries Service review applications for these federal permits and provide comments to the ACOE on the environmental impacts of the proposed work.

State Endangered Species Regulations were enacted in the State through the Maryland Endangered Species Act of 1971 (Article 66C, Section 125, Annotated Code of Maryland), which became the first piece of state legislation to protect endangered species in Maryland. This legislation prohibits the taking, transportation, possession, processing, or sale within the State of Maryland of any wildlife appearing on the Federal lists of endangered, foreign or native fish and wildlife. Secondly, it mandated the Secretary of the Maryland Department of Natural Resources to develop a list of fish and wildlife deemed to be threatened with statewide extinction in Maryland. This provided for full protection from taking and possession of those species. The DNR list includes all of the federally listed species, and lists species which are threatened or endangered within their range in Maryland. As of 1997, this list includes 137 species of animals and 498 species of plants, of which 28 occur, or once occurred, in Harford County. The Maryland Natural Heritage Program, which maintains the comprehensive inventory of the state's natural diversity, was established in 1979 as a cooperative effort of DNR and The Nature Conservancy.

The Federal Endangered Species Regulations were first enacted as the 1973 Endangered Species Act (ESA). These regulations provide a program for the conservation of endangered and threatened species and for the ecosystems upon which they depend. The U.S. Fish and Wildlife Service (FWS) shares responsibility for endangered and threatened species with the National Marine Fisheries Service of the Department of Commerce (NMFS). The FWS has jurisdiction over all terrestrial and freshwater species and a few marine mammals, while the NMFS is responsible for most marine species. Section 4 of the Endangered Species Act provided for the development and maintenance of an official list of endangered and threatened species. As of April 1997, this list includes 447 species of animals and 634 species of plants, of which 19 occur, or once occurred, within the State of Maryland. In addition, 110 species of plants and animals have been proposed for listing. Four species on the Federal threatened and endangered species list occur, or once occurred, within Harford County. These are the Bald Eagle, the Maryland Darter, the Shortnose Sturgeon, and the Bog Turtle.

The Clean Air Act was passed by Congress in 1955, with major amendments until the most recent 1990 amendments. In general, Maryland's air pollution program authorizes the State's Department of the Environment to monitor air quality, establish standards, require permits, and take enforcement actions. One of the main goals of the 1990 Amendments is to reduce volatile organic compounds

(VOCs), nitrogen oxides, and carbon monoxide (CO). Many programs have been and will continue to be initiated to reduce these potential pollutants until Maryland's air quality meets all of EPA's acceptable levels.

The Safe Drinking Water Act Amendments of 1996 establish a strong emphasis on preventing contamination problems through source water protection. One of the main goals of the Amendments is to provide high quality water to users of public water systems. All public water supplies are mandated to have a completed Source Water Assessment by November 2001. These Source Water Assessments require three sets of activities:

1. Delineate boundaries of source water areas,
2. Identify contaminant sources, and
3. Assess the susceptibility of source waters to contamination.

Better consumer information and public involvement in drinking water protection are built into these Amendments. Community Water Systems will be required to send customers an annual report with information about their water source and the level of contaminants in the treated drinking water.

VOLUNTARY PROGRAMS AND ADVISORY COMMITTEES

The Chesapeake Bay Program is a multi-agency organization created to direct the regulatory efforts for the restoration of the Bay's water quality and fish and wildlife habitat. The Chesapeake Bay Program was established by the States of Pennsylvania, Maryland, and Virginia, the District of Columbia, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency as a joint commitment to restore the Chesapeake Bay. In 1987, these parties signed the Bay Agreement to remedy the most pervasive pollution problem by working cooperatively toward a 40% reduction in nutrients entering the Bay by the year 2000. In 1992, these agencies acknowledged that the Bay was in decline because of the changes in the watershed as a whole, and, likewise, that the Bay's restoration is dependent upon a watershed-wide solution. The Bay Agreement was therefore amended to require tributary-specific plans for nutrient reduction in the Bay's major tributaries. Harford County lies within the Upper Western Shore Tributary.

Maryland's Tributary Strategies is a state-wide, comprehensive, watershed approach to reduce nutrient pollution on a watershed basis for the Chesapeake Bay. The Upper Western Shore Tributary Basin, one of ten tributary basins to the Chesapeake Bay, includes all of Harford County and parts of Baltimore, Cecil, and Carroll Counties. These basins were designated as a means to develop the most efficient and effective strategy to meet the 40% nutrient reduction goals for the Bay. Implementation teams, appointed by the Governor, were established in each of the ten basins. The teams, composed of State and local agencies, farmers, businesses, environmental organizations, Federal facilities, and citizens, meet regularly to assist with implementation of the strategies. The strategies include a combination of existing regulatory programs and comprehensive voluntary programs.

The National Flood Insurance Program (NFIP) was created to provide property insurance to cover flood losses. Harford County has participated in this program since 1978. All loans made by federally

insured and regulated lenders for buildings in floodprone areas are required to be secured with flood insurance. In order for flood insurance to be available, Harford County must maintain a floodplain management program limiting development in floodprone areas so as to protect human life and health, preserve the flood storage capacity of the floodplain, and implement flood resistant construction practices where building exists. Because of the County's outstanding Flood Management Program , residents of Harford County have the option of purchasing flood insurance through the National Flood Insurance Program at discounted rates.

The Chesapeake Bay National Estuarine Research Reserve (CBNERR) in Maryland is part of a national reserve system that was established to protect estuarine areas as natural field laboratories for long-term research and monitoring. CBNERR provides opportunities for education in addition to promoting public awareness, understanding, and appreciation of estuarine ecosystems.

In Maryland, CBNERR is managed by the State's Department of Natural Resources in cooperation with local government agencies and private landowners. CBNERR consists of three components: Monie Bay in Somerset County, Jug Bay in Anne Arundel and Prince Georges Counties, and Otter Point Creek in Harford County. Otter Point Creek is managed by CBNERR, Harford County Department of Parks and Recreation, and the Izaak Walton League of America. Otter Point Creek component, totalling 672 acres, consists of two land areas connected by water. It includes Leight Park (61 acres), Bosley Conservancy (350 acres), and State-owned water (261 acres).

The Envirothon is a national competition sponsored by Soil Conservation Districts that tests students' knowledge in five natural resource areas: soils, wildlife, forestry, aquatics, and a current environmental issue. It is an in-depth, hands-on learning experience for students interested in nature and environmental studies. The students supplement their regular academic classes with workshops, reading, and field work. Teams representing their high schools compete in county, state, and national competitions where they are judged on a research project, field knowledge, and the five natural resource areas listed above.

LOCAL ADVISORY COMMITTEES

The Planning Advisory Board (PAB) was created under the Harford County Charter to advise the Director of Planning and Zoning, the County Executive, and the County Council on matters of land use planning and zoning. The powers and duties of the PAB include:

- Recommendations to the Director of Planning and the County Council relating to Master Plans, Zoning Maps, and rules and regulations relating to planning and zoning;

- Consideration of and recommendations to an itemized list of all capital projects and the capital improvement programs which all agencies of the County government propose to undertake in the ensuing fiscal year and the next succeeding five years, thereafter; and

- At least once every eight years, the PAB prepares general guidelines for use by the Department of Planning and Zoning in preparation of the Master Plans.

The Environmental Advisory Board (EAB) was created by legislation in 1984 to advise the County Executive and the County Council on environmental issues, to encourage the preservation and protection of the natural environment of the County, and to work with federal, state, or local agencies in furthering the goal of preserving and protecting the environment of the County. The EAB consists of nine residents of Harford County. Members of the EAB are selected to be representative of organizations concerned with environmental issues including: existing conservation and environmental groups, the agricultural community, the homebuilders' associations, consulting engineers, technical professionals, major county institutions, and citizens at large. The powers and duties of the EAB include:

- Review of management recommendations that have evolved from the summary reports of the Environmental Protection Agency Chesapeake Bay Program.
- Review and comment on major County policy plans to ensure that environmental concerns are adequately addressed.
- Assist government and private organizations in educating the citizens of Harford County on issues concerning the environment.
- Review proposed County legislation and administrative rules and regulations which may have a significant impact on the environment of the County.
- Study, evaluate, and make recommendations to the County Executive on any matter which may have a significant impact on the natural environment of the County.

The Environmental Land Preservation Commission (ELPC) was established in 1990 to promote the protection and preservation of environmentally significant lands in Harford County. The ELPC works in cooperation with the Maryland Environmental Trust or any other qualified land trust to promote and solicit conservation easements on environmentally sensitive lands. The ELPC coordinates its recommendations and efforts on environmentally sensitive areas through the Departments of Planning and Zoning and Public Works.

STATE, REGIONAL, AND FEDERAL ADVISORY COMMITTEES

The Coastal and Watershed Resources Advisory Committee (CWRAC) is an advisory body to Maryland's Coastal Zone Management Program. It is composed of citizens, umbrella groups, academic institutions, and local, State, and Federal agencies that provide guidance towards best uses, conservation, and preservation of Maryland's coastal resources. Harford County is represented on this Committee by a local government representative and a citizen representative, both appointed by the County Executive. It was established in 1976 as a unit within the State's Department of Natural Resources, and is funded under a grant from the National Oceanic and Atmospheric Administration.

The Forestry Board manages tree planting programs, tree farm tours, educational forums, and

participates in a statewide newsletter to support forestry in Harford County. The Forestry Board reviews proposed State and local legislation affecting forestry, and represent the interests of forestry with local, State, and Federal leaders. The Forestry Board reviews all timber harvest permit applications for harvests proposed within the Chesapeake Bay Critical Area. The Maryland Department of Natural Resources, Forest Service, supports Forestry Boards which are groups of voluntary citizens who act as advocates for forestry interests.

The Reservoir Technical Group is a multi-jurisdictional task force under the auspices of the Baltimore Metropolitan Council (BMC) whose mission is to protect the water supply reservoirs in the Baltimore Metropolitan area, i.e., Pretty Boy, Loch Raven, and Liberty. In 1984, the City of Baltimore and the Counties of Baltimore, Carroll, Howard, and Harford signed the Reservoir Watershed Management Agreement to focus on the critical need to protect the drinking water supplied from these reservoirs. The following goals were established:

1. Prevent increased phosphorus and sediment loading in all three reservoirs; and
2. Reduce phosphorus loadings in Loch Raven, Liberty, and Prettyboy Reservoirs to acceptable levels (levels that are not likely to cause algal blooms) as soon as possible.

Coordinated action had to be taken to correct algal blooms caused by phosphorus from sewage treatment plants, agricultural practices, and non-point source pollution. The Reservoir Technical Group implements action strategies and coordinates efforts to identify and attack pollution problems in the watersheds. Since Harford County is a user of the Baltimore City water system, it has a stake in decisions that may affect quality or quantity of a major source of drinking water.

PARTNERSHIPS

Partnerships with other agencies and organizations are essential for designing and implementing Harford County's natural resources protection strategies. Three important functions of partnerships are the pooling of resources (such as data, staff, and research); the elimination of duplicate work; and the opportunity for dialogue on issues that do not adhere to political boundaries such as water quality, air quality, and water supply. Harford County exchanges information with State, Federal, and regional agencies in order to develop cooperative programs and policies that promote stewardship of the environment. These partnerships provide for the protection of wetlands, forests, stream buffers, floodplains, steep slopes, and water quality.

As discussed, community participation is integral to any policy development in the County. Citizens, the towns, and environmental and community organizations are encouraged to participate in county-wide conservation efforts. An informed citizenry is essential to building the public support necessary to accomplish the goals of this plan. Environmental education efforts currently originate from a variety of sources including the Public Schools; the County Departments of Public Works, Planning and Zoning, Health, and Parks and Recreation; the Community Planning Councils; the Soil Conservation District; and the Otter Point Creek and Harford Glen Environmental Education Centers. Through a more coordinated effort, resulting in a building of partnerships to accomplish environmental education goals, a land and water stewardship ethic may be nurtured and expanded.

PARTNERSHIPS

Federal Agencies

1. Department of Transportation
2. US Army Corps of Engineers
3. Federal Emergency Management Agency,
   National Flood Insurance Program
4. National Oceanic & Atmospheric Administration
   National Estuarine Research Reserve
5. Department of Agriculture,
   Natural Resources Conservation Service
6. Department of the Army,
   Aberdeen Proving Ground

Regional Agencies

1. Chesapeake Bay Program
2. Upper Western Shore Tributary Strategy Team
3. Coastal and Watershed Resources Advisory Committee
4. Baltimore Metropolitan Council
5. Save Our Streams

State Agencies

1. Maryland Office of Planning
2. Department of Natural Resources
3. Maryland Department of the Environment
4. State Highway Administration
5. Mass Transit Authority
6. Maryland Transportation Authority
7. Chesapeake Bay Trust

Local Agencies

1. Harford Soil Conservation District
2. Harford Land Trust
3. Lower Susquehanna Heritage Greenway Commission
4. Harford County Schools, Board of Education
5. Municipalities: Town of Bel Air, City of Aberdeen, and City of Havre de Grace

STRATEGY FOR THE FUTURE

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The Natural Resources Element Plan includes a series of recommendations that identify various work initiatives needed to implement the plan. These recommendations include the preparations of Watershed Plans, completion of specific studies, and review and revision of existing programs and regulations. A work program has been developed to prioritize these initiatives (See Action Plan Timeline). This work program establishes an eight-year agenda, and includes a timeline for the completion of the various tasks.

TASKS OF THE NATURAL RESOURCES ELEMENT PLAN - AN ACTION PLAN

Based on the recommendations of the Natural Resources Element Plan, several tasks emerge as priorities. These tasks include development of legislation for protection of rare habitats; revision of the Natural Resources District regulations; development of watershed plans; identification and implementation of mitigation areas for wetlands and forests; update of the Flood Management

Program; development of Wellhead Protection Programs wherever public groundwater systems exist; and cooperation in the work of the Source Water Assessment Program. In addition, opportunities for environmental education will be explored throughout all of the efforts. These tasks are discussed below.

Rare, Threatened, and Endangered Species Habitat Protection Legislation

Habitats of rare, threatened, and endangered species are protected by State and Federal permit programs such as the Joint 404 Wetlands Permit System throughout the County. However, these programs often leave upland habitats unprotected. Recorded rare, threatened, and endangered species habitats within the County are currently protected at the local level only in the Critical Area. New legislation will be drafted to afford protection to the habitats of these species throughout the County, where these are not adequately protected by State and Federal programs, as required by the Maryland Economic Growth, Resource Protection and Planning Act of 1992.

Timeline: 1998-2000

Revision of the Natural Resources District Legislation

Legislation enacting the Natural Resources District in Harford County was passed in 1982. This district protects many of the sensitive environmental features of the County, such as steep slopes, nontidal wetlands, and streams and their buffers. This legislation will be reviewed to streamline review efforts and more effectively protect these resources. Appropriate buffer widths will be reviewed. Timeline: 1998-2000 *Perryman Wellfield Protection Program*

To protect the quality and quantity of the water supply from the Perryman Wellfield, Harford County will develop a wellfield protection program to minimize the impact of industrial land uses. This program will include delineating a specific recharge area and developing management standards and other protection tools, as well as public awareness efforts.

Timeline: 1998 - 2000

Development of Watershed Plans

Watershed management plans are considered one of the most effective tools to address water resource issues in a comprehensive fashion. The foundation for the development of watershed management plans in the County has already been laid. Watershed studies have been completed by the Department of Public Works for Swan Creek and Bynum Run watersheds, with Winters Run currently underway. In addition, the Watershed Planning System Study undertaken with the Maryland Office of Planning will be used in the development of watershed management plans.

Timeline: 1999-2005

Biological Inventories and Natural Resource Mapping

Up-to-date, accurate inventories of the natural resources of the County are essential to meeting the goals of the Natural Resources Element Plan. Coordination with the Maryland Department of Natural Resources is needed to update the threatened and endangered species inventory of flora and fauna for the County.

Timeline: Ongoing Activity

Mitigation Banking Program for Wetlands and Forests

Federal, State, and local regulations require replacement of wetlands and forests to mitigate their loss during land development when avoidance of wetlands is not possible. There is a need to provide opportunities and alternatives to address these mitigation requirements in a coordinated approach. Identification of mitigation areas for forests and wetlands, as well as coordination of mitigation efforts with other water quality and resource protection efforts, will be explored as the basis of a mitigation banking program in the County.

Timeline: 1999 - 2002

Revision of County Flood Management Program

The revision of the County's Flood Management Program will be a two-part process. The floodplain regulations will be reviewed, and revised if necessary, to ensure that new construction will be carried out in accordance with standards set forth in the National Flood Insurance Program. In addition, a new set of floodplain maps will be proposed to the County Council for adoption as the official floodplain maps for Harford County. These new maps were based on the County's 1990 topographic base map.

Timeline: 1997-1999

Community Wellhead Protection Efforts

To protect the quality and quantity of community groundwater supplies, Harford County will coordinate with the Maryland Department of the Environment (MDE) to assist in the efforts to develop wellhead protection programs for community water systems. Harford County will coordinate with MDE and the operators of community water systems in future implementation efforts.

Timeline: 1999-2002

Source Water Assessment Program

As a result of the Safe Drinking Water Act Amendments of 1996, there is a focus on the prevention of pollution as the first step in the provision of high-quality water resources for public drinking water supplies. Source water assessments will be undertaken for the public water supplies in the County to

determine the boundaries of the areas providing source waters and an identification of potential pollutant sources. The County will continue to coordinate the Source Water Assessment Program with MDE and other participants, and encourage public participation throughout the development of the Program.

Timeline: 1998-2002

Critical Area Program Updates

Each local jurisdiction is required by State law to review and update its Critical Area Program every four years based on the anniversary date of local program adoption. The next Program Review will be in the year 2000; therefore, the County will begin its Program review during 1999, and again in 2003. The reviews will include updating resource inventory information and recommending changes necessary to improve the implementation and enforcement of the Program.

Timeline: 2000 and 2004

Education/Stewardship Initiative

Education of our citizens, and the development and fostering of a stewardship ethic, is the foundation of many of the environmental initiatives of this Plan. The County's efforts to protect sensitive areas and maintain a quality living environment must be supported and driven by a populace interested in preserving the quality of life they associate with Harford County, including clean air, clean water, and a healthy natural environment. An education/stewardship program will be developed and implemented. All existing environmental outreach programs in the County will be identified, and opportunities for coordination and collaboration among the various agencies and organizations implementing these programs will be explored. Additional opportunities for improving public awareness about environmental issues and encouraging environmental stewardship will be developed. A timeline for implementation of the program will also be developed. Techniques to be used will include brochures, environmental displays, newspaper articles, and public forums.

Timeline: 1998 - 2005

GLOSSARY

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Attainment Area - A geographic area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined by the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

Biological resource inventory - A list of the living resources (plants, animals) located in the County.

Best management practices - Conservation practices or systems of practices and management measures that control erosion and other adverse impacts caused by point and/or nonpoint source

pollution.

Clean Air Act of 1990 - Enacted by Congress, it is the strongest legislation to-date to clean up the air. For the purpose of reducing smog, the Act requires states to reduce emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx). Through amendments to the Act, the nation's lawmakers specified how the states must meet Federal air quality standards. They also established the Ozone Transport Commission to address the region-wide problem posed by ground level ozone.

Community Rating System - Rewards local jurisdictions that adopt and enforce a floodplain management ordinance that exceeds the minimum standards established by the National Flood Insurance Program (NFIP). The reward consists of reduced flood insurance premium for residents.

Federal Emergency Management Agency (FEMA) - The purpose of this agency is to provide leadership and support to reduce loss of life and property and to protect our institutions from all types of hazards.

Floodplain - Land area subject to inundation by water from any flooding source. Its function is to store and absorb flood waters.

Greenways - Natural corridors that provide for a diversity of plant and animal species. These corridors connect plant and animal communities to one another. When located on public lands, they may also provide opportunities for people to experience nature through hiking or riding trails.

Homebased activities - Actions at homes that can have a negative effect on the environment, such as using small gasoline powered engines, oil-based paints, fertilizing lawns, etc.

Hydric soil - A soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. Intelligent Transportation Systems - This program uses electronic, computer, and telecommunication technologies to improve intermodal transportation.

Mitigation banking - A method of focusing natural resource (wetland, forest, riparian buffer, etc.) replacement required to offset the loss of the resource during development to a location where it would be most beneficial, and create a more productive natural system.

Natural corridors - (see Greenways)

National Flood Insurance Program (NFIP) - This Federal program identifies floodprone areas nationwide and makes flood insurance available to the owners and lessees of property in the communities that voluntarily participate in the program. The communities participate by adopting and enforcing floodplain management standards that are consistent with Federal regulations.

Nonattainment Area - A geographical area where an ambient air quality standard is not being met. An area may be a nonattainment area for one pollutant and an attainment area for another.

Non-Tidal Wetlands - All palustrine aquatic bed, palustrine emergent, palustrine forested and palustrine scrub-shrub wetlands as defined by the United States Fish and Wildlife Service, excluding tidal wetlands. These non-tidal wetlands are land where the water table is usually at or near the surface (i.e., periodically saturated), or areas where the substrate or soil is covered by shallow water at some time during the growing season. The non-tidal wetlands are further characterized by one or both of the following two attributes: (1) The land supports predominantly obligate or facultative- wet hydrophyte plant species cited in the Department of Natural Resources publication entitled "Vascular Plant Species Occurring in Maryland Wetlands"; or (2) The substrate is predominantly hydric soil.

Ozone Action Days - Days when the air quality is predicted to exceed EPA health-based standards. Each afternoon the Maryland Department of the Environment (MDE) and the Metropolitan Washington Council of Governments (COG) issue an air quality forecast for the following day. The forecasts are separated into four codes: Unhealthful, Approaching Unhealthful, Moderate, and Good. With each code, there are recommended actions to modify individual's and businesses' activities to reduce ozone-producing activities.

Park and Ride - A designated site usually accessible by a major transportation facility, to be used for the purposes of carpooling and mass transit by the general public.

Serpentine Soils - Shallow soils formed by the weathering of serpentine rock. Serpentine rock is composed of layers of chrysotile and antigorite, with or without other minerals. Serpentine rock usually has a dull green color, often with a spotted or mottled appearance. In Harford County, serpentine soils include the Chrome series, and some of the Kelly series where rock outcrops are apparent at the surface.

Steep slopes - Areas of land greater than 40,000 square feet with a slope in excess of a certain amount, usually twenty-five percent (25%) slopes are regulated. Stream - A perennial or intermittent watercourse having a defined channel (excluding manmade ditches) which contains flow from surface and groundwater sources during at least 50% of an average rainfall year.

Tidal Wetlands - Any land bordering on or lying beneath tidal waters which is subject to regular or periodic tidal action and supports aquatic growth, including, but not limited to, lands identified as tidal wetlands on the most current Department of Natural Resources Tidal Wetlands Boundaries Maps.

Transportation Control Measures - Techniques that reduce the number of vehicles on the road system while providing for a wide variety of mobility options. Examples of this include carpools, public transit, non-motorized travel (including bicycling and walking), and financial/time incentives.

Vegetative composition - An area of land usually located along streams that is maintained by grass, shrubs, or trees that are designed to capture and filter runoff and sediment from surrounding land uses.

Watershed - The total area of land that contributes surface runoff water to the flow of a waterway; a

drainage basin or a major subdivision of a drainage basin that is usually divided by topography.

Watershed Planning - Planning which examines the cumulative effect of land use changes on the water quality of the streams and the ground water draining an area. This analysis helps to identify where gain or loss of wetlands or forested areas will have the greatest impact. This involves a comparison of information about surface and ground water quality and stream habitats to the existing and planned land uses for the nine watersheds, and identification of areas where improvements to water quality can be made.

Wellhead Protection Area - The surface and subsurface area surrounding a well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field.

Wetland - See Tidal Wetlands and Non-Tidal Wetlands.

REFERENCES

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U.S. Dept. of Agriculture, Soil Conservation Service, in cooperation with Maryland Agricultural Experiment Station. 1973. *Soil Survey of Harford County Area, Maryland*. Cartographic Division, RCSD, USDA. 188 pp., plus maps

Tiner, R.W., and D.G. Burke. 1995. *Wetlands of Maryland*. U.S. Fish and Wildlife Service, Ecological Services, Region 5, Hadley, MA and Maryland Department of Natural Resources, Annapolis, Maryland. Cooperative publication. 193. pp., plus appendices

M.L. Brown and R.G. Brown. 1984. *Herbaceous Plants of Maryland*. Port City Press, Baltimore, Maryland. 1127 pp.

Brown, M.L. and R.G. Brown. 1972. *Woody Plants of Maryland*. Port City Press, Baltimore, Maryland. 347 pp.

National Oceanic and Atmospheric Administration data from 1951-1978, as reported in the APG Management Plan for the Bald Eagle, 1996.

Code of Federal Regulations. Title 50. 17.11&17.12. October 31, 1996. Endangered and Threatened Wildlife and Plants. U.S. Fish and Wildlife Service. 46 pp.

Norden, A.W., D.C. Forester, and G.H. Fenwick, eds. 1984. *Threatened and Endangered Plants of Maryland, Proceedings of a Symposium*, Sept. 1981. Department of Natural Resources, Annapolis, Maryland. 475 pp.

Appendix 1: Surface Water and Soils

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SURFACE WATERS

There are several ways to describe surface waters. For example, they can be classified according to relative size, type, direction of flow (tidal or nontidal), location in a watershed, or uses provided. The surface waters of Harford County fall into three major groups: rivers and streams, reservoirs and ponds, and tidal waters associated with the Chesapeake Bay. These categories describe surface waters according to water chemistry (salt or fresh water) and by type of flow (ponded, unidirectional, or tidal). Surface waters may also be described according to the Maryland Department of Natural Resources (DNR) classification which describes the potential uses of these waters. Alternatively, surface waters may be described by their relative location in the watershed by "order." The latter two descriptive systems are explained briefly below.

DNR has classified all surface waters (streams, rivers, estuaries, bays, ponds, and lakes) in the State according to their potential uses by man. These classifications which are listed in COMAR 26.08.02.08 are based upon the optimal use of the stream. Harford County surface waters fall into Class I, Class III, or Class IV. The designation of "P" after the class indicates that this surface water is used as a source of public drinking water. Class I streams are used for water contact sports and recreation, fishing, growth and propagation of fish other than trout, other aquatic life and wildlife, agricultural water supply, and industrial water supply. This is a generalized classification used for all streams not designated as Class III or Class IV. Class II waters are shellfish-harvesting waters, of which there are none within the jurisdiction of the county. Class III waters are natural trout waters. These waters are capable of supporting self-sustaining trout populations and their food organisms. Class IV waters are recreational trout waters. This use designation includes cold or warm waters which have the potential for, or are capable of holding or supporting, adult trout for put-and-take fishing, and/or are managed as a special fishery by periodic stocking and seasonal catching.

Stream orders indicate the location of a stream in the watershed and the relative size of a stream. First-order streams are generally unnamed surface waters at the top of the watershed and include seeps, headwaters, intermittent streams, and small perennial streams. Where two first-order streams combine, they create a second-order stream. These streams are generally small perennial streams and include some named streams such as Elbow Branch in the Deer Creek Watershed. Where two second-order streams combine, they create a third-order stream. These are large perennial streams

which are generally named. Third-order streams in Harford County include the upper reaches of Winters Run, Bynum Run, James Run, Swan Creek, Church Creek, and Broad Creek.

SOILS

Soil is defined as a natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material as conditioned by relief over periods of time. The County's soils fall roughly into three major associations of the Upper and Lower Piedmont and the Coastal Plain. These are described in more detail below.

Upper Piedmont Soil Associations

The northwestern half of Harford County is characterized by well-drained soils weathered in place from acid crystalline rock. These soils are deeply incised by stream floodplain valleys of stratified alluvial sediments with similar chemistry to that of the upland soils. Soil types of this area include Manor, Glenelg, Chester, Glenville, Elioak, Stony Land, Brandywine, Codorus, Comus, Hatboro, and Baile. Manor, Glenelg, and Chester are the most common soil types in the County, representing approximately 19%, 19%, and 16%, respectively of the County's soils. A unique association of well-drained soils underlain by acid slate occurs in the vicinity of Whiteford. All of the larger streams of Harford County except Bynum Run (Broad Creek, Deer Creek, Winters Run and the Little Gunpowder River) originate in these soil associations. Well yields and stream baseflow in this area are typically low, averaging about 5-10 gallons per minute. Most of this area is farmland and woodland.

Lower Piedmont Soil Associations

Southeast of the Upper Piedmont area, a ridge cuts diagonally across the County from Dublin to Benson along the path followed by Route 1. Soils along this ridge are grouped in the Monalto-Neshaminy-Aldino association. Surrounding this ridge on either side at the northeast end and on the southern side at the southwest end is the Neshaminy-Aldino-Watchung association. This latter association is characterized by broad flats and large poorly drained areas. This association also includes outcroppings of serpentine which are identified in the Soil Survey by Chrome and Aldino soils. Two smaller areas of the Legore-Neshaminy-Aldino association also occur in this area on low ridges west of Aberdeen and Havre de Grace. Streams originating from soils of these three Piedmont associations include Swan Creek, Carsins Run, Grays Run, James Run, Broad Run, Bynum Run, and Plumtree Run. In addition, a large area of the lower Deer Creek watershed is of these associations. Soils of the floodplain valleys of this area are similar to those of the northwestern half of Harford County.

Coastal Plain Soil Associations

The third broad area of soils in Harford County are the soils of the Atlantic Coastal Plain. The Neshaminy-Chillum-Sassafras association is similar to the associations described above, but may also include sandy and gravelly Coastal Plain sediments. The Beltsville-Loamy and Clayey Land-

Sassafras and Matapeake-Mattapex associations are well-drained to moderately well-drained soils underlain by sediments. The Elsinboro-Delanco association are stratified alluvial soils also underlain by sediment on the lower terraces. The lowest floodplain terraces have soils which are similar to those of the floodplain valleys of the rest of the County. Gasheys Run, Ha Ha Branch, and Cranberry Run are the only major streams in Harford County which originate in the Coastal Plain soil associations. Coastal Plain sediments are characterized by stratified layers of clay, silt, loam, sand, and gravel. Wetlands are a dominant feature of the Coastal Plain. Soils with clay, silt, and/or a fragipan that impede drainage near the surface are common in the Coastal Plain and include the Delanco, Elkton, Fallsington, Hatboro, Keyport, Kinkora, Leonardtown, Loamy and Clayey Land, Matapex, and Othello types. Nontidal wetlands are prevalent throughout these types. The drier sandy and loamy soils of the Coastal Plain include the Joppa, Beltsville, Elsinboro, Evesboro, Mattapeake, and Sassafras types.

Steep Slopes as a Sensitive Area

Steep slopes are areas where the lay of the land promotes the loss of soil primarily to surface waters during rain storms and the melting runoff of spring thaw. These areas are defined by soil type in *The Harford County Soil Survey* (1975), which lists 25 soil types which cover areas of 15% or greater slope. Soils with a slope greater than 15% are mapped over an area of 45,110 acres (+/- 10 acres) or approximately 19% of the County's land area, excluding APG. There are 8 soil types of 25% or greater slope. These soils cover an area of 11,820 acres or approximately 5% of the County's land area, excluding APG.

Appendix 2: Harford County Rare Species and Habitats

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ANIMALS

Scientific Name	Common Name	Animal Type
Acipenser brevirostrum	Shortnose Sturgeon	fish
Acipenser oxyrhynchus	Atlantic Sturgeon	fish
Clemmys muhlenbergi	Bog Turtle	reptile
Etheostoma sellare	Maryland Darter	fish
Graptemys geographica	Map Turtle	reptile
Haliaeetus leucocephalis	Bald Eagle	bird
Percina caprodes	Logperch	fish
Speyeria idalia	Regal Fritillary	insect
Sterna albifrons	Least Tern Colony	bird
Stygobromus tenuis potomacus	Potomac Amphipod	crustacean

PLANTS

Scientific Name	Common Name	Plant Type
Antennaria solitaria	Single headed Pussytoes	herb
Arabis shortii	Short's Rockcress	herb
Arisaema dracontium	Green Dragon	herb
Asclepias verticillata	Whorled Milkweed	herb
Bidens Bidentoides	Maryland Bur marigold	herb
Campanula rotundifolia	Harebell	herb
Cardamine douglassii	Purple Cress	herb
Carex bromoides	Brome like Sedge	sedge
Carex brunnescens	Brownish Sedge	sedge
Carex bushii	Bush's Sedge	sedge
Carex interior	Inland Sedge	sedge
Carex languinosa	Wooly Sedge	sedge
Carex radiata	Stellate Sedge	sedge
Castanea pumila	Chinquapin	shrub
Chamaelirium luteum	Devil's bit	herb
Cirsium muticum	Swamp Thistle	herb
Commelina virginica	Virginia Dayflower	herb
Corydalis sempervirens	Pale Corydalis	herb
Cystopteris tennesseensis	Tennessee Bladder fern	fern
Diplazium pycnocarpon	Glade Fern	fern
Dryopteris celsa	Log Fern	fern
Elatine minima	Small Waterwort	herb
Erigenia bulbosa	Harbinger of Spring	herb
Eriocaulon parkerii	Parker's Pipewort	herb

HARFORD COUNTY RARE SPECIES AND HABITATS
PLANTS, continued

Scientific Name	Common Name	Plant Type
Euphorbia purpurea	Darlington's Spurge	herb
Fimbristylis annua	Baldwin's Fimbristylis	sedge
Gentiana andrewsii	Fringe tip Closed Gentian	herb
Hybanthus concolor	Green Violet	herb

Hydrastis canadensis	Goldenseal	herb
Hydrocotyle verticillata	Whorled water pennywort	herb
Iris prismatica	Slender Blue Flag	herb
Isoetes riparia	Riverbank Quillwort	fern
Juglans cinerea	Butternut	herb
Limnosella australis	Mudwort	herb
Linum sulcatum	Grooved Flax	herb
Ludwigia decurrens	Primrose Willow	herb
Magnolia tripetala	Umbrella Magnolia	tree
Matteuccia struthiopteris	Ostrich Fern	fern
Monarda clinopodia	Basil Bee balm	herb
Myosotis macrosperma	Large seeded Forget me not	herb
Najas flexilis	Slender Naiad	herb
Panicum flexile	Wiry Witchgrass	grass
Polygala senega	Seneca Snakeroot	herb
Potamogeton foliosis	Leafy Pondweed	herb
Rhododendron atlanticum	Dwarf Azalea	shrub
Sabatia dodecandra	Large Marsh Pink	herb
Sagittaria calycina	Spongy Lophotocarpus	herb
Sagittaria longirostra	Long beaked Arrowhead	herb
Sanguisorba canadensis	Canada Burnet	herb
Sanicula trifoliata	Three leaved Snakeroot	herb
Scirpus cylindricus	Saltmarsh Bulrush	rush
Scirpus verecundus	Bashful Bulrush	rush
Scleria pauciflora	Fewflower Nutrush	sedge
Scutellaria leonardii	Leonard's Scullcap	herb
Senecio anonymus	Small's Ragwort	herb
Senecio pauperculus	Balsam Ragwort	herb
Smilacina stellata	Star flowered False Solomon's seal	herb
Solidago patula	Sharp leaved Goldenrod	herb
Stenanthium gramineum	Featherbells	herb
Synosma suaveolens	Sweetscented Indian plantain	herb
Talinum teretifoliun	Flameflower	herb
Trillium ceruum	Nodding Trillium	herb
Trillium erectum, v. album	White form of Red Trillium	herb
Valeriana pauciflora	Valerian	herb
Zizia aurea	Golden Alexanders	herb

RARE COMMUNITIES

Hemlock/Birch community
Great Laurel community
Serpentine Savanna community
Flatwoods community
Old Growth Hemlock Stand

Appendix 3: Animals of Harford County

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FISH

Common Name	Scientific Name	Common Name	Scientific Name
Alewife[1,2]	Alosa psuedoharengus	Needlefish, Atlantic[1,2]	Strongylura marina
Anchovy, Bay[1,2]	Anchoa mitchelli	Perch, Silver1	Bairdiella chrysura
Bass, Large Mouth[1,2]	Micropterus salmoides	Perch, White[1,2]	Morone americana
Bass, Small Mouth[1,2]	Micropterus dolomieui	Perch, Yellow[1,2]	Perca flavescens
Bass, Striped[1,2]	Morone saxatilis	Pickeral, Chain[2]	Esox niger
Bluefish[1,2]	Pomatomus saltatrix	Pikeral, Redfin[2]	Esox americanus
Butterfish[1]	Perprillus Tricanthus	Pipefish, Northern[1]	Syngnathus fuscus
Carp[1,2]	Cyprinus carpio	Puffer, Northern1	Shoeroides maculatus
Catfish, Brown Bullhead[1,2]	Ictalurus nebulosis	Seatrout, Spotted[1]	Cynoscion nebulosus
Catfish, Channel[1,2]	Ictalurus punctatus	Shad, American[1,2]	Alosa sapidissima
Catfish, White[1,2]	Ictalurus catus	Shad, Gizzard[1,2]	Drosoma cepedianum
Catfish, Yellow Bullhead[1]	Ictalurus natalis	Shad, Hickory[1]	Alosa mediocris
Chupsucker, Creek[1]	Erimyzon oblongus	Shiner, Bridle[1]	Notropis bifrenatus
Crappie, Black[1,2]	Pomoxis nigromaculatus	Shiner, Comley[1]	Notropis amoenus
Crappie, No. Sea Robin[1]	Pomoxis carolinus	Shiner, Golden[1,2]	Notemigonus crysolencas
Crappie, White[1,2]	Pomoxis annularis	Shiner, Satinfin[1,2]	Notropis analostanus

Croaker, Atlantic[1,2]	Micropogon undulatus	Shiner, Spottail[1,2]	Notropis hudsonius
Darter, Tesselated[1,2]	Etheoestoma olmstedi	Silverside, Atlantic[1,2]	Menidia menidia
Drum, Black[1]	Pogonias cromis	Silverside, Rough[1,2]	Membras martinica
Eel, American[1,2]	Anguilla rostrata	Silverside, Tidewater[1,2]	Menidia beryllina
Flounder, Summer[1]	Paralichthys dentatus	Spot[1,2]	Leiostomus xanthurus
Flounder, Winter[1]	Psuedoplueronectus americanus	Sturgeon, Atlantic1	Acipenser oxyrhynchus
Gobi, Naked[1,2]	Gobiosoma bosci	Sucker[1]	Minytrema saxatilis
Goldfish[1,2]	Carassius auratus	Sucker, Carp[1]	Carpoides carpio
Hake, Silver[1]	Merluccis bilinearis	Sucker, Spotted[1]	Minytrema melanops
Hake, Spotted[1]	Urophycis regius	Sunfish, Blue Spotted[1]	Enneasanthus gloriosus
Harvestfish, Southern[1]	Perprillus para	Sunfish, Bluegill[1,2]	Lepomis macrochirus
Herring, Atlantic[1]	Clupea harengus	Sunfish, Green[1,2]	Lepomis cyanellus
Herring, Blueback[1,2]	Alosa aestivalis	Sunfish, Longear[1,2]	Lepomis megalotis
Hogchoaker[1,2]	Trinectes maculatus	Sunfish, Pumpkinseed[1,2]	Lepomis gibbosus
Killifish, Banded[1,2]	Fundulus diaphanus	Sunfish, Red Breast[1]	Lepomis auritus
Killifish, Mumichog[1,2]	Fundulus heteroclitus	Toadfish, Oyster[1]	Opsanus Tau
Killifish, Striped[1,2]	Fundulus majalis	Weakfish[1]	Cynoscion regalis
Menhaden, Atlantic[1,2]	Brevoortia tyrannus	Whitesucker[1]	Catotomus commersoni
Minnow, Silvery[1,2]	Hybognanthus nuchalis		

AMPHIBIANS

Bullfrog[1,2]	Rana catesbeiana	Salamander, Marbled[1,2]	Ambystoma opacum
Bullfrog, Green[1,2]	Rana clamitans melanota	Salamander, Redbacked[1,2]	Plethodon c. cinereas
Bullfrog, No. Leopard[1,2]	Rana p. pipiens	Salamander, Spotted[1,2]	Ambystoma maculatum
Bullfrog, Pickeral[1,2]	Rana palustris palustris	Toad, American[1,2]	Bufo a. americanus
Bullfrog, So. Leopard[1,2]	Rana p. sphenocephala	Toad, Fowler's[1,2]	Bufo woodhousei fowleri

Bullfrog, Wood[1,2]	Rana sylvatica	Treefrog, Eastern Gray[1,2]	Hyla v. versicolor
Chorus Frog, Upland[1,2]	Pseudacris triseriata feriarum	Treefrog, Green[1,2]	Hyla cinerea
Cricket Frog, No.[1]	Acris crepitans crepitans	Treefrog,No.Spring Peeper[1,2]	Hyla c. crucifer
Eft, Red[1]	Diemictylus viridesens		

REPTILES

Black Racer, Northern[1,2]	Coluber c. constrictor	Terrapin, No. Diamondback[1,2]	Malaclemys t. terrapin
Fence Lizard, Northern[1,2]	Sceloporus undulatus hyacinthinus	Turtle, Bog[1,2]	Clemmys muhlenbergi
Garter Snake, Eastern[1,2]	Thamnophis s. sirtalis	Turtle, Eastern Box[1,2]	Terrepene c. carolina
Hognosed Snake, Eastern[1,2]	Heterodon platyrhinos	Turtle, Eastern Mud[1,2]	Kinosternon s. subrubrum
King Snake, Eastern[1,2]	Lampropeltis g. getulus	Turtle, Eastern Painted[1,2]	Chrysemys p. picta
Milk Snake, Eastern[1,2]	Lampropeltis doliata	Turtle, Red bellied[1,2]	Chrysemys rubriventris
Queen Snake[1,2]	Regina s. Septemvittata	Turtle, Red eared[1,2]	Chrysemys scripta clegans
Rat Snake, Black[1,2]	Elaphe o. obsolet	Turtle, Snappingv[1,2]	Chelydra s. serpentina
Ribbon Snake, Eastern[1,2]	Thamnophis s. sauritus	Turtle, Spotted[1,2]	Clemmys guttata
Ringneck, Northern[1,2]	Diadophis punctatus edwardsi	Water Snake, Northern[1,2]	Natrix s. sipedon
Skink, Five lined[1,2]	Eumaces fasciatus	Worm Snake, Eastern[1,2]	Carphophis a. amoenus

BIRDS - Waders, Gulls, & Terns

Bittern, American[1,3]	Botaurus lentiginosus	Sandpiper, Spotted[2,3]	Actitis macularia
Bittern, Least[2,3]	Ixobrychus exilis	Sandpiper, Upland[3]	Bartramia longicauda
Dowitcher, Short billed[3]	Limnodromus griseus	Yellowlegs, Greater[2,3]	Tringa melanoleuca
Egret, Cattle[3]	Bubulcus ibis	Yellowlegs, Lesser[3]	Tringa flavipes

Egret, Great[1,2,3]	Casmerodias albus	Gull, Bonaparte's[3]	Larus philadelphia
Egret, Snowy[1,3]	Egretta thula	Gull, Glaucous[3]	Larus hyperboreus
Heron, Great Blue[1,2,3]	Ardea herodias	Gull, Great Blk backed[1,2,3]	Larus marinus
Heron, Green[2]	Butorides striatus	Gull, Herring[1,2,3]	Larus argentatus
Heron, Little Blue[3]	Florida caerulea	Gull, Iceland[3]	Larus glaucoides
Ibis, Glossy[2,3]	Plegadis falcinellus	Gull, Laughing[1,3]	Larus atricilla
Night Heron, Blk crowned[2,3]	Nycticorax nycticorax	Gull, Lesser Blk backed[3]	Larus fuscus
Plover, Black bellied[3]	Pluvialis squatarola	Gull, Ring billed[1,2,3]	Larus delawarensis
Plover, Killdeer[1,2,3]	Charadrius vociferus	Gull, Thayers[3]	Larus thayerii
Plover, Semipalmated[3]	Charadrius semipalmatus	Tern, Caspian[2,3]	Sterna caspia
Sandpiper Least[2,3]	Calidris minutilla	Tern, Common[3]	Sterna hirundo
Sandpiper, Dunlin[3]	Calidris alpina	Tern, Foster's[3]	Sterna forsteri
Sandpiper, Pectoral[3]	Calidris melanotis	Tern, Least[3]	Sterna albifrons
Sandpiper, Semipalmated[3]	Calidris pusilla	Tern, Royal[3]	Sterna maxima
Sandpiper, Solitary[3]	Tringa solitaria		

BIRDS - Other Waterbirds

Coot, American[1,2,3]	Fulica americana	Gallinule, Moorhen[1,3]	Gallinula chloropus
Cormorant, Double crested[2,3]	Phalacrocorax auritus	Goose, Cananda[1,2,3]	Branta canadensis

BIRDS - Other Waterbirds, continued

Common Name	Scientific Name	Common Name	Scientific Name
Duck, American Black[1,2,3]	Anas rubripes	Goose,Great White fronted[3]	Anser albifrons
Duck, American Wigeon[3]	Anas americana	Goose, Snow[3]	Chen caerulescens
Duck, Bufflehead[2,3]	Bucephala albeola	Grebe, Horned[1,3]	Podiceps auritus
Duck, Canvasback[1,2,3]	Aythya valisneria	Grebe, Pied billed[2]	Podilymbus podiceps
Duck, Common Goldeneye[1,2,3]	Bucephala clangula	Loon, Common[1,3]	Gavia immer
Duck, Gadwall[2,3]	Anas strepera	Loon, Red throated[3]	Gavia stellata

Duck, Greater Scaup[1,3]	Aythya marila	Merganser, Common[1,3]	Mergus merganser
Duck, Lesser Scaup[3]	Aythya affinis	Merganser, Hooded[3]	Lophodytes cucullatus
Duck, Mallard[1,2,3]	Anas platyrhynchos	Merganser, Red breasted[3]	Mergus serrator
Duck, Northern Pintail[3]	Anas acuta	Rail, King[3]	Rallus elegans
Duck, Northern Shoveler[3]	Anas clypeata	Rail, Virginia[3]	Rallus limicola
Duck, Oldsquaw[1,3]	Clangula hyemalis	Sora[1]	Porzana carolina
Duck, Redhead[2,3]	Aythya americana	Swan, Mute[3]	Cygnus olor
Duck, Ring necked[3]	Aythya collaris	Swan, Whistling[1,3]	Olor columbianus
Duck, Ruddy[3]	Oxyura jamicensus	Teal, Blue winged[1,2,3]	Anas discors
Duck, Wood[1,2,3]	Aix sponsa	Teal, Green winged[3]	Anas crecca

BIRDS - Upland Game Birds

Bobwhite, Northern[1,2,3]	Colinus virginianus	Snipe, Common[2,3]	Capella gallinago
Dove, Mourning[1,2,3]	Zenaida macrooura	Turkey, Wild[1,2,3]	Meleagris gallopavo
Dove, Rock[1,2,3]	Columba livia	Woodcock, American[1,2,3]	Philohela minor
Pheasant, Ring necked[1,3]	Phasianus colchicus		

BIRDS - Raptors

Eagle, Bald[1,2,3]	Haliaeetus leucocephalus	Osprey[1,2,3]	Pandion haliaetus
Eagle, Golden[1]	Aquila chrysaetos	Owl Snowy[3]	Nyctea scandiaca
Falcon, American Kestral[1,2,3]	Falco sparverius	Owl, Barn[1,3]	Tyto alba
Falcon, Merlin[3]	Falco columbarius	Owl, Barred[1,2,3]	Strix varia
Falcon, Peregrin[1,3]	Falco peregrinus	Owl, Eastern Screech[2,3]	Otus asio
Harrier, Marsh hawk[1,2,3]	Circus cyaneus	Owl, Great horned[1,2,3]	Bubo virginianus
Hawk, Broad winged[2,3]	Buteo platypteris	Owl, Long eared[3]	Asio otus
Hawk, Cooper's[2,3]	Accipiter cooperii	Owl, Northern Saw whet[3]	Aegolius acaicus

Hawk, Red shouldered[1,2,3]	Buteo lineatus	Owl, Short eared[3]	Asio flammeus
Hawk, Red tailed[1,2,3]	Buteo jamaicensis	Vulture, Black[1,2,3]	Coragyps atratus
Hawk, Rough legged[3]	Buteo lagopus	Vulture,Turkey[1,2,3]	Cathartes aura
Hawk, Sharp shinned[2,3]	Accipiter striatus		

BIRDS - Swallows & Nighthawks

Martin, Purple[2,3]	Progne subis	Swallow, Rough winged[3]	Stelgidopteryx furicollis
Nighthawk, Common[2,3]	Chordeiles minor	Swallow, Tree[1,2,3]	Iridoprocne bicolor
Swallow, Bank[3]	Riparia riparia	Swift, Chimney[1,2,3]	Chaetura pelagica
Swallow, Barn[1,2,3]	Hirundo rustica	Whip poor will[3]	Caprimulgus vociferus
Swallow, Cliff[2,3]	Petrochelidon pyrrhonota		

BIRDS - Woodpeckers

Common Name	Scientific Name	Common Name	Scientific Name
Flicker, Northern[1,2,3]	Colaptes auratus	Woodpecker, Red bellied[1,2,3]	Centurus carolinus
Sapsucker, Yellow bellied[1,2,3]	Sphyrapicus varius	Woodpecker, Red headed[2,3]	Melanerpes erythrocephalus
Woodpecker, Hairy[1,2,3]	Dendrocopus villosus	Woodpecker, Downy[1,2,3]	Dendrocopus pubscens
Woodpecker, Pileated[2,3]	Dryocopus pileatus		

BIRDS - Perching Birds

Blackbird, Red winged[1,2,3]	Agelaius phoeniceus	Nuthatch, Red breasted[2,3]	Sitta canadensis
Blackbird, Rusty[1,2,3]	Euphagus carolinus	Nuthatch, White breasted[1,2,3]	Sitta carolinensis
Bluebird, Eastern[1,2,3]	Sialia sialus	Oriole, Baltimore[1,2,3]	Icterus galbula
Bobolink[1,2,3]	Dolichonyx oryzivorus	Oriole, Lichtenshtein's[2]	Icterus gularis

Brown Creeper[1,2,3]	Certhia familiaris	Oriole, Orchard[1,2,3]	Icterus spurius
Bunting, Indigo[1,2,3]	Passerina cyanea	Ovenbird[1,2,3]	Seiurus aurocapillus
Bunting, Snow[3]	Plectrophenax nivialis	Pewee, Eastern Wood[1,2,3]	Contopus virens
Cardinal, Northern[1,2,3]	Cardinalis cardinalis	Phoebe, Eastern[1,2,3]	Sayornis phoebe
Catbird, Gray[1,2,3]	Dumetella carolinensis	Pipit, American[3]	Anthus spinoletta
Chat, Yellow breasted[1,2,3]	Icteria vireus	Redpoll, Common[3]	Carduelis flammea
Chickadee, Black capped[3]	Parus atricapillu	Redstart, American[1,2,3]	Setophaga ruticilla
Chickadee, Carolina[1,2,3]	Parus carolinensis	Robin, American[1,2,3]	Turdus migratorius
Cowbird, Brown headed[1,2,3]	Molothrus ater	Shrike, Loggerhead[1,2,3]	Lauius ludovicianus
Crow, American[1,2,3]	Corvus brachyrhynchos	Siskin, Pine[3]	Carduelis pinus
Crow, Fish[1,2,3]	Corvus ossifragus	Sparrow, Chipping[1,2,3]	Spizella passerina
Cuckoo, Black billed[3]	Coccyzus erythropthalamus	Sparrow, Field[1,2,3]	Spizella pusilla
Cuckoo, Yellow billed[1,2,3]	Coccyzus americanus	Sparrow, Fox[1,3]	Passerella iliaca
Finch, House[1,2,3]	Carpodacus mexicanus	Sparrow, Grasshopper[3]	Ammodramus savannarum
Finch, Purple[3]	Carpodacus purpureus	Sparrow, House[1,2,3]	Passer domesticus
Flycatcher, Acadian[1,2,3]	Empidonax virescens	Sparrow, Savannah[1,2,3]	Passerculus sandwichensis
Flycatcher, Great Crested[1]	Myriarchus crinitus	Sparrow, Song[1,2,3]	Melospiza melodia
Flycatcher, Least[3]	Empidonax minimus	Sparrow, Swamp[2,3]	Melospiza georgiana
Flycatcher, Willow[1,3]	Empidonax trailii	Sparrow, Tree[1,2,3]	Spizella arborea
Flycatcher, Yellow bellied[3]	Empidonax flaviventris	Sparrow, Vesper[2,3]	Pooecetes gramineus
Gnatcatcher, Bluegray[1,2,3]	Polioptila caerulea	Sparrow, White crowned[2,3]	Zonotrichia leucophrys
Goldfinch[1,2,3]	Carduelis tristis	Sparrow, White throated[1,2,3]	Zonotrichia ablicollis
Grackle, Common[1,2,3]	Quiscalus quiscula	Starling, European[1,2,3]	Sturnus vulgaris
Grosbeak, Blue[1,2,3]	Guiraca caerulea	Tananger, Scarlet[1,2,3]	Piranga olivacea

Grosbeak, Evening[2,3]	Hesperiphona vespertina	Tananger, Summer[1]	Piranga rubra
Grosbeak, Rose breasted[2,3]	Pheucticus ludovicianus	Thrasher, Brown[1,2,3]	Toxostoma rufum
Hummingbird, Ruby throated[2,3]	Archilochus colubris	Thrush, Gray cheeked[2,3]	Catharus minimus
Jay, Blue[1,2,3]	Cyanocitta cristata	Thrush, Hermit[2,3]	Catharus guttatus
Junko, Dark eyed[1,2,3]	Junco hyemalis	Thrush, Swainson's[2,3]	Catharus ustulatus
Kingbird, Eastern[1,2,3]	Tyrannus tryrannus	Thrush, Veery[2,3]	Catharus fuscescens
Kingfisher, Belted[1,2,3]	Megaceryle alcyon	Thrush, Wood[1,2,3]	Hylocichla mustelina
Kinglet, Gold crowned[1,2,3]	Regulis satrapa	Titmouse, Tufted[1,2,3]	Parus bicolor
Kinglet, Ruby crowned[2,3]	Regulus calendula	Towee, Rufous sided[1,2,3]	Pipilo erythrophthalmus
Lark, Horned[2,3]	Eremophila alpestris	Vireo, Philadelphia[2,3]	Vireo philadelphicus
Longspur, Lapland[3]	Calcarius lapponicus	Vireo, Red eyed[1,2,3]	Vireo olivaceus

BIRDS - Perching Birds, continued

Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Meadowlark, Eastern[1,2,3]	Sturnella magna	Vireo, Solitary[2,3]	Vireo solitarius
Mockingbird, Northern[1,2,3]	Mimus polyglottus	Vireo, Warbling[1,3]	Vireo gilvus
Vireo, White eyed[1,2,3]	Vireo griseus	Warbler, Northern Parula[1,2,3]	Parula americana
Vireo, Yellow throated[1,2,3]	Vireo flavifrons	Warbler, Orange crowned[2]	Vermivora celata
Warbler, Bachman's[2]	Vermivora bacnmanii	Warbler, Palm[2,3]	Dendroica palmarum
Warbler, Bay breasted[3]	Dendroica castanea	Warbler, Pine[2,3]	Dendroica pinus
Warbler, Black and white[2,3]	Mniotilta varia	Warbler, Prairie[2,3]	Dendroica discolor
Warbler, Blackburnian[2,3]	Dendroica fusca	Warbler, Prothonotory[2,3]	Prothonotaria citrea
Warbler, Blackpoll[2,3]	Dendroica striata	Warbler, Tennessee[2,3]	Vermivora peregrina
Warbler, Blk throated blue[2,3]	Dendroica caerulescens	Warbler, Wilson's[1,3]	Wilsonia pusilla

Warbler, Blk throated green[2,3]	Dendroica virens	Warbler, Worm eating[3]	Helmitheros virmivoros
Warbler, Blue winged[3]	Vermivora pinus	Warbler, Yellow[1,2,3]	Dendroica petechia
Warbler, Canada[2,3]	Wilsonia canadensis	Warbler, Yellow rumped[1,2,3]	Dendroica coronata
Warbler, Cape May[2,3]	Dendroica tigrina	Warbler, Yellow throated[3]	Dendroica dominica
Warbler, Cerulean[3]	Dendroica cerulea	Waterthrush, Louisiana[3]	Seiurus motacilla
Warbler, Chestnut sided[2,3]	Dendroica pensylvanica	Waterthrush, Northern[2,3]	Seiurus noveboracensis
Warbler, Connecticutt[3]	Oporornis agilis	Waxwing, Ceder[1,2,3]	Bombycilla cedrorum
Warbler, Golden winged[3]	Vermivora chrysoptera	Wren, Carolina[1,2,3]	Thyrothorus ludovicianus
Warbler, Hooded[2,3]	Wilsonia citrina	Wren, House[1,2,3]	Troglodytes aedon
Warbler, Kentucky[1,2,3]	Oporornis formosus	Wren, Marsh[1,2,3]	Cistothorus palustris
Warbler, Magnolia[1,2,3]	Dendroica magnolia	Wren, Winter[2,3]	Troglodytes troglodytes
Warbler, Mourning[3]	Oporornis philidelphia	Yellowthroat, Common[1,2,3]	Geothlypis tricha
Warbler, Nashville[2,3]	Vermivora ruficapilla		

MAMMALS - Rodents

Mole, Eastern[1,2]	Scalapus aquaticus	Beaver[1,2]	Castor canadensis
Mole, Star nosed[1,2]	Condylura cristata	Muskrat[1,2]	Ondatra zibethicus
Shrew, Least[1,2]	Crytotis parva	Woodchuck[1,2]	Marmota monax
Shrew, Masked[1,2]	Sorex cinereus fontinalis Mouse, Deer[2]	Peromyscus maniculaus	
Shrew, Pigmy[1,2]	Microsorex hoyi	Mouse, Eastern Harvest[1,2]	Reithrodontomys humulis
Shrew, Short tailed[1,2]	Blarina brevicauda	Mouse, House[2]	Mus musculus
Shrew, Southeastern[2]	Sorex longirostris	Mouse, Meadow Jumping[1,2]	Zapus hudsonius
Cottontail, Eastern[1,2]	Sylvilagus floridanus	Mouse, White footed[1,2]	Peromyscus leucopus
Lemming, Bob[1,2]	Synaptomys cooperi	Rat, Black[2]	Rattus rattus
Vole, Meadow[1,2]	Microtus pennsylvanicus	Rat, Norway[1,2]	Rattus norvegicus

Vole, Pine[1,2]	Microtus pinetorum	Rat, Rice[1,2]	Orysomys palustris

MAMMALS - Squirrels & Chipmunks

Chipmunk, Eastern[1,2]	Tamias striatus	Squirrel, Gray[1,2]	Sciurus carolinensis
Flying Squirrel, Southern[1,2]	Glauconys volans	Squirrel, Red[1,2]	Tamiascurrus hudsonicus
Squirrel, Fox[1,2]	Sciurus niger vulpinces		

MAMMALS - Bats

Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Bat, Big Brown[1,2]	Eptesicus fuscus	Myotis, Little Brown[2]	Myotis lucifugus
Bat, Silver haired[1,2]	Lasionycteris noctivagans	Myotis, Small footed[2]	Myotis subulatus
Bat, Red[1,2]	Lasiurus borealis	Bat, Evening[1,2]	Nycticeius humeralis
Bat, Horary[1,2]	Lasiurus cinereus	Pipstrelle, Eastern[1,2]	Pipistrellus subflavus
Myotis, Keen's[1,2]	Myotis keenii		

MAMMALS - Weasels & Skunks

Mink[1,2]	Mustela vison	Weasel, Long tailed[1,2]	Mustela frenata
Otter, River[1,2]	Lutra canadensis	Weasel, Least[2]	Mustela rixosa
Skunk, Striped[1,2]	Mephitis mephitis		

MAMMALS - Opossums & Raccoons

Opossum[1,2]	Didelphis virginiana	Raccoon[1,2]	Procyon lotor

MAMMALS - Hooved Animals

Deer, White tailed[1,2]	Odocoileus virginianus		

MAMMALS - Foxes& Cats

Fox, Red[1,2]	Vulpes fulva	Bobcat[1,2]	Lynx rufus
Fox, Grey[1,2]	Urocyon cinereoargenteus		

INVERTEBRATES (Future Listings)

References:

1. US Army Research Laboratory at APG On Going Mission Operations Appendix J for Environmental Assessment. February 1995.
2. Perryman Power Plant Certification of Public Convenience and Necessity, Environmental

Review Document, Vol. 1, 1989.
3. Harford County Chesapeake Bay Critical Area Program Management Document,Table 11, as amended, 1997.